

# RADIOLOGY

A MONTHLY JOURNAL DEVOTED TO CLINICAL RADIOLOGY AND ALLIED SCIENCES

Vol. 73

DECEMBER 1959

No. 6

## CONTENTS

THE TREATMENT OF CARCINOMA OF THE LOWER LIP.  
*J. A. Del Regato, M.D., and J. M. Sala, M.D.* 839

RADICAL PREOPERATIVE ROENTGEN THERAPY IN PRIMARILY INOPERABLE ADVANCED CANCERS OF THE HEAD AND NECK.  
*Franz Buschke, M.D., and Maurice Galante, M.D.* 845

PYEOGRAPHY IN RENAL DISEASE WITH HYPERTENSION. CORRELATION BETWEEN PYELOGRAPHIC FINDINGS AND DIFFERENTIAL RENAL FUNCTION STUDIES.  
*Lucy Frank Squire, M.D., and Jorgen U. Schlegel, M.D.* 849

CLINICAL EVALUATION OF RADIOACTIVE CHROME PHOSPHATE IN THE CONTROL OF MALIGNANT PLEURAL AND ASCITIC EFFUSIONS.  
*Charles R. Perryman, M.D., D.Sc. (Med.), Edward J. Pavsek, M.D., and John D. McAllister, M.D.* 865

THE DIAGNOSIS OF PERICARDIAL EFFUSION WITH INTRACARDIAC CARBON DIOXIDE.  
*James H. Scalliff, M.D., Alfred J. Kummer, M.D., and Arnold H. Janzen, M.D.* 871

RADIOGRAPHIC FINDINGS IN RENAL VEIN THROMBOSIS.  
*Norman Zheutlin, M.D., Dixon Hughes, M.D., and Bernard J. O'Loughlin, M.D., Ph.D.* 884

ROENTGENOGRAPHY AND BIOPSY IN MAMMARY CANCER.  
*Simon M. Berger, M.D., Helen Ingleby, M.D., and J. Gershon-Cohen, M.D., D.Sc.* 891

CYST OF THE LEFT TRIANGULAR LIGAMENT OF THE LIVER.  
*Andrew K. Poznanski, M.D., C.M.* 896

A LIMITED SURVEY OF RADIATION EXPOSURE FROM MEDICAL FLUOROSCOPES.  
*Robert Owen Gorson, M.D., Jesse Lieberman, M.S., and Marvin Green, B.S.* 898

DESIGN OF FREE-AIR IONIZATION CHAMBERS FOR THE SOFT X-RAY REGION (20-100 KV).  
*Victor H. Ritz, B.S.* 911

USE OF MAGNETIC TAPE FOR RECORDING RADIOACTIVITY.  
*Solomon N. Albert, M.D., H. N. Eccleston, Jr., M.D., T. Fujita, M.D., Charles H. Hunter, M.D., and Chalom A. Albert, M.D.* 923

EDITORIAL: RADIATION CONTROL AT THE GRASSROOTS.  
*Richard H. Chamberlain, M.D.* 927

ANNOUNCEMENTS AND BOOK REVIEWS. 929

ABSTRACTS OF CURRENT LITERATURE. 934

INDEX TO VOLUME 73. 967

# RADIOLOGY

A MONTHLY PUBLICATION DEVOTED TO CLINICAL RADIOLOGY AND ALLIED SCIENCES  
PUBLISHED BY THE RADILOGICAL SOCIETY OF NORTH AMERICA

#### ASSOCIATE EDITORS

Leo G. Rigler, M.D.  
Laurence L. Robbins, M.D.  
Harold W. Jacox, M.D.  
William R. Eyler, M.D.

#### PUBLICATION COMMITTEE

William T. Moss, M.D., Chairman  
John A. Evans, M.D.  
John D. Reeves, M.D.

#### EDITOR

HOWARD P. DOUB, M.D.  
Henry Ford Hospital, Detroit 2, Mich.

#### EDITORIAL ASSISTANTS

Marion B. Crowell, A.B.  
Florence Roper Jeffery, A.B.  
Arlene W. Hippie, A.B.

#### ADVISORY EDITORIAL BOARD

Richard H. Chamberlain, M.D.  
Edith H. Quimby, Sc.D.  
Arthur Purdy Stout, M.D.  
Donald S. Childs, Jr., M.D.

## GENERAL INFORMATION

Second-class mail privileges authorized at Syracuse, New York with additional entry at Easton, Pennsylvania. Acceptance for mailing at a special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized November 24, 1934. RADIOLOGY is published by the Radiological Society of North America as its official Journal. Publication office, 20th and Northampton Streets, Easton, Pa. Subscription rate \$10.00 per annum. Canadian postage, \$1.00 additional. Foreign postage, \$2.00 additional. Single copies \$2.00 each. All correspondence relative to business matters connected with the Radiological Society of North America and RADIOLOGY, or remittance for non-member subscriptions, should be made payable to the Radiological Society of North America and should be addressed to the BUSINESS MANAGER, DONALD S. CHILDS, M.D., 713 E. GENESSEE STREET, SYRACUSE 2, NEW YORK. In requesting change of address, both the old and the new address should be given.

Dues to the Radiological Society of North America include subscription to RADIOLOGY and should be paid to DONALD S. CHILDS, M.D., SECRETARY-TREASURER, 713 E. GENESSEE STREET, SYRACUSE 2, NEW YORK.

The rate for "want" advertisements for insertion in the Classified Section is 8 cents per word, minimum charge \$2.00. Remittance should accompany order. Rates for display advertisements will be furnished upon request.

Inquiries regarding the program for the Annual Meeting of the Society for the current year should be sent to the President.

RADIOLOGY is published under the supervision of the Publication Committee of the Radiological Society of North America, which reserves the right to reject any material submitted for publication, including advertisements. No responsibility is accepted by the Committee or the Editor for the opinions expressed by the

contributors, but the right is reserved to introduce such changes as may be necessary to make the contributions conform to the editorial standards of RADIOLOGY. Correspondence relating to publication of papers should be addressed to the EDITOR, HOWARD P. DOUB, M.D., HENRY FORD HOSPITAL, DETROIT 2, MICHIGAN.

Original articles will be accepted only with the understanding that they are contributed solely to RADIOLOGY. Articles in foreign languages will be translated if they are acceptable. Manuscripts should be typewritten double-spaced, with wide margins, on good paper, and the original, not a carbon copy, should be submitted. The author's full address should appear on the manuscript. It is advisable that a copy be retained for reference as manuscripts will not be returned.

Illustrations and tables should be kept within reasonable bounds, as the number which can be published without cost to the author is strictly limited. For excess figures and for illustrations in color, estimates will be furnished by the Editor. Photographic prints should be clear and distinct and on glossy paper. Drawings and charts should be in India ink on white or on blue-lined coordinate paper. Blueprints will not reproduce satisfactorily. All photographs and drawings should be numbered, the top should be indicated, and each should be accompanied by a legend with a corresponding number. Authors are requested to indicate on prints made from photomicrographs the different types of cells to which attention is directed, by drawing lines in India ink and writing in the margin. The lines will be reproduced, and the words will be set in type. Attention should be called to points which should be brought out in completed illustrations, by tracings and suitable texts. These instructions should be concise and clear.

As a convenience to contributors to RADIOLOGY who are unable to supply prints for their manuscripts, the Editor can arrange for intermediate prints from roentgenograms.

Contents of RADIOLOGY copyrighted 1959 by The Radiological Society of North America, Inc.

# RADIOLOGY

A MONTHLY JOURNAL DEVOTED TO CLINICAL RADIOLOGY AND ALLIED SCIENCES  
PUBLISHED BY THE RADIOLOGICAL SOCIETY OF NORTH AMERICA

Vol. 73

DECEMBER 1959

No. 6

## The Treatment of Carcinoma of the Lower Lip<sup>1</sup>

J. A. del REGATO, M.D.<sup>2</sup>, and J. M. SALA, M.D.<sup>3</sup>

A VARIETY of procedures may be effective in the treatment of carcinoma of the lower lip, but the chances of control and the esthetic and functional results vary depending on the circumstances of the case. The form of treatment to be preferred is thus determined by the size of the primary lesion, the presence or absence of concomitant metastases, the degree of differentiation of the tumor, and whether or not the patient has received previous unsuccessful treatment.

The following considerations and conclusions are based on the study of 531 consecutive cases of previously untreated carcinoma of the lower lip admitted to the Ellis Fischel Cancer Hospital (Columbia, Mo.) from 1940 to 1953. A second group of 103 consecutive recurrences after treatment elsewhere is reported separately.

### HISTOLOGY

In all of the 531 patients the diagnosis of carcinoma was confirmed by biopsy. Many cases of extensive ulceration of the lower lip with the clinical appearance of cancer proved to be chronic inflammatory lesions associated with hyperkeratosis and are not reported here.

The overwhelming majority of the tumors were well differentiated: 59 were of the so-called verrucous type and 336

were Grade I carcinomas. There were 103 cases classified as Grade II, and only 4 as Grade III. In 29 additional cases the diagnosis of carcinoma was made, but for various reasons grading could not be attempted.

### TREATMENT OF THE PRIMARY LESION

In a great number of small carcinomas of the lower lip, a simple V-excision constitutes simultaneous biopsy and treatment; the procedure is expeditious and adequate provided that no more than one-fourth of the entire extent of the lip needs to be removed to assure a safe margin. Beyond this, surgical removal often requires a cheiloplasty, and the functional and esthetic results may be less satisfactory than those of radiotherapy. Resection of the primary lesion may be chosen, in spite of lesser esthetic result, in order to expedite the surgical treatment of a metastasis. In advanced lesions with jaw involvement or with a large defect, the surgeon may best plan his cosmetic attempts if he is allowed to manage the case from the beginning. Also, in cases of recurrence after various methods of treatment, surgery is often to be proposed. In the majority of lesions of moderate or large size, however, in the absence of concomitant metastases, radiotherapy, as directed by the circumstances

<sup>1</sup> Presented at the Forty-fourth Annual Meeting of the Radiological Society of North America, Chicago, Ill., Nov. 16-21, 1958.

<sup>2</sup> Director, Penrose Cancer Hospital, Colorado Springs, Colo.

<sup>3</sup> Chief of Radiotherapy, Ellis Fischel Cancer Hospital, Columbia, Mo.



Fig. 1. Extensive verrucous carcinoma of the lower lip invading the skin. A. Before treatment. B. After roentgen therapy, which was given over a period of several weeks.

of the case, is a much safer method and one which permits the most remarkable esthetic results.

In a few of the cases reported here, surface radium was used for the treatment of the primary tumor. This approach is certainly effective, though painstaking, in small lesions. The procedure was discontinued sixteen years ago. We feel that roentgen therapy can well satisfy all of the indications of radiotherapy.

The variations in technic of roentgen therapy are simply related to the size of the primary tumor. Most of the cases reported here were treated with 110 kv and 0.25 mm. of copper filtration. In a few advanced cases 250 kv was used; we sought the better quality rather than the penetration of the higher-voltage radiations. Since surgical excision was preferred for the small lesions, in the majority of those treated by roentgen therapy a treatment period of less than ten days was not justified. Fractionation was extended to six weeks in some cases, depending on the size of the area to be treated. The total dose administered must vary with the length of the treatment: our doses were of the order of 3,000 r (measured in air at the surface of the lesion) for treatments of less than ten days, and of as much as 7,000 r for treatments of six weeks duration. Daily applications of divided doses are

preferred, but the recent tendency has been to maintain the same daily dose throughout the course, until the desired total is attained.

We feel rather strongly that the care of the mucous membrane and skin reactions following radiotherapy is the responsibility of the radiotherapist. Their neglect leads to lesser esthetic results and to complications. Care of these radiation effects is best achieved by daily antiseptic spray and oily dressings. In some instances of contamination, administration of antibiotics becomes necessary until the epidermic layer is entirely repaired.

#### THE TREATMENT OF METASTASES

The metastasizing ability of carcinomas of the lower lip is rather low; only 33 (6 per cent) of the 531 cases in this series presented metastases on admission. In an additional 39 patients metastases subsequently developed: in 7 of this latter group there was a concomitant recurrence. The development of metastases was roughly related to the size of the primary lesion but more so to the degree of undifferentiation of the tumor: only 1 of the 59 verrucous carcinomas metastasized, and 36 among 336 Grade I carcinomas. The relative proportion of metastases was greater among the fewer undifferentiated tumors: 28 metastases among 103 Grade II carci-

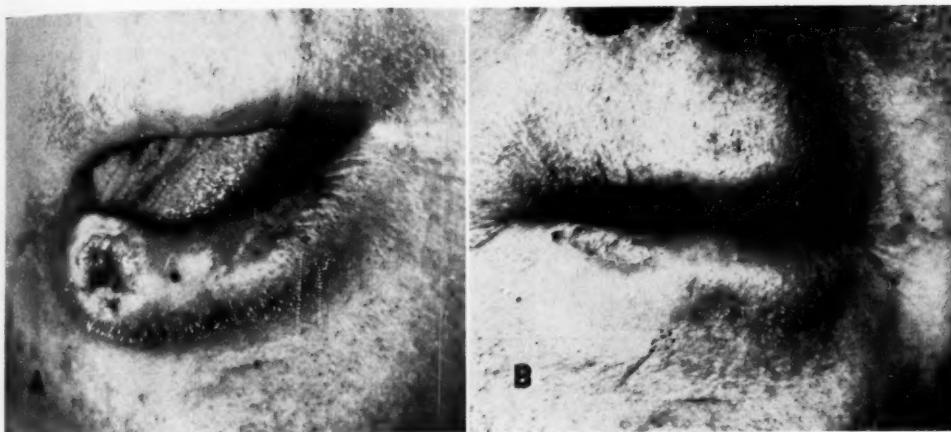


Fig. 2. Ulcerated carcinoma of the vermillion border of the lower lip. A. Before treatment. B. After roentgen therapy.



Fig. 3. Extensive multicentric carcinomas of the vermillion border of the lower lip. A. Before treatment. B. After roentgen therapy.

nomas, and 2 in the 4 cases of Grade III.

The most frequent site of metastasis from carcinoma of the lower lip is the prevascular node of the anterior submaxillary region, but metastases also occur in the submental region and in the facial node group in the lower part of the cheek, lateral to the jaw. The treatment of choice is a neck dissection. We formerly adhered to the view that a so-called suprathomohyoid dissection was sufficient in most cases, but experience has taught us that this operation is frequently inadequate. Since the metastasizing tumors are often of the more malignant variety, a more radical neck

dissection is justified; today this does not imply any greater risk to the patient and has a better record of control. Since the lymphatics of the lower lip may cross the midline, the neck dissection should often be extended to include the contralateral submental and submaxillary lymph nodes.

Because of the low incidence of metastases, a *prophylactic*<sup>4</sup> neck dissection is not indicated as a routine procedure, but in the presence of highly undifferentiated advanced primary lesions or in patients with

<sup>4</sup> A prophylactic neck dissection is one which is done for early treatment of likely metastases in a subclinical stage.

TABLE I: CARCINOMA OF THE LOWER LIP WITHOUT PREVIOUS TREATMENT AND WITHOUT METASTASES ON ADMISSION: CHOICE OF TREATMENT AND RESULTS RELATED TO SIZE OF THE LESION. 1940-1953

Size	Form of Treatment and Number of Cases	Dead Without Cancer Within Three Years	Total Local Recurrences*	Subsequent Metastases†	Dead with Cancer	Well Three Years or More	Absolute Three-Year Survival
Under 2 cm.	Surgery 210	35	7	14 (2)	4	171	81%
	Curietherapy 34	4	..	3	1	29	85%
	Roentgen therapy 62	11	..	..	..	51	82%
2-12 cm.	Surgery 45	10	5 (2)	1	2	33	73%
	Curietherapy 13	2	1	2 (1)	2	9	70%
	Roentgen therapy 129	21	12	19 (4)	9	99	76%
	Palliation 5	..	..	..	5	..	..
TOTAL		498	83	25	39 (7)	23	392
* Eighteen local recurrences without metastases. All subsequently controlled except 2 in parenthesis.							
† Figures in parentheses indicate concomitant recurrences.							

TABLE II: CARCINOMA OF THE LOWER LIP: FATE OF PATIENTS WITH METASTASES. 1940-1953

	Treatment and Number of Patients	Dead Within Three Years Without Cancer	Dead with Cancer	Well Three Years or More	Absolute Three-Year Survival
Metastases on admission	Subtotal dissection 17	4	6	7	41%
	Radical dissection 6	..	1	5	83%
	Palliative 5	..	5	..	..
	Abstention 5	..	5	..	..
	TOTAL 33	4	17	12	38%
Subsequent metastases*	Subtotal dissection 18 (2)	4	5	9 (2)	50%
	Radical dissection 13 (3)	1	3 (2)	9 (2)	61%
	Palliative 5 (2)	..	5 (2)	..	..
	Abstention 3	..	3	..	..
	TOTAL 39 (7)	5	16 (4)	18 (4)	46%
GRAND TOTAL 72		9	33	30	41%

\* Figures in parentheses indicate concomitant recurrences.

a history of previous unsuccessful treatment, an *elective prophylactic* neck dissection may occasionally be justified. Without denying that radiotherapy in any of its different manifestations is sometimes capable of destroying a metastatic focus, we feel that it is not a rational approach and that it cannot compete with neck dissection in a series of cases.

#### RESULTS

We have chosen to make a three-year term report of survival because (a) the proportion of deaths from intercurrent disease within a short time following treatment is rather large in this group of elderly patients; (b) only 3 of the 17 local recurrences took place after thirty-six months, and it is a question whether these may not have been second adjacent primaries rather

than recurrences; (c) only 4 of the 39 cases of metastases which became apparent after treatment were discovered after thirty-six months.

Statistics of results are not, of course, a statement of certainty as to the permanence of control. A five-year survival rate is considerably more meaningful in that respect for carcinoma of the cervix than for carcinoma of the breast. As indicated above, our patients with carcinoma of the lower lip were for the most part elderly; hence there was a large proportion of deaths from intercurrent diseases within three years. Had the survival period been longer, there is no assurance that a recurrence or metastasis might not have taken place in some of these patients and, consequently, they cannot be eliminated from the statistical considerations. On the other hand,

TABLE III: CARCINOMA OF THE LOWER LIP; RECURRENCES FROM PREVIOUS TREATMENT ELSEWHERE: CHOICE OF TREATMENT AND RESULTS. 1940-1953

Treatment and Number of Patients		Average Size	Dead Within Three Years Without Cancer	Recurrences	Subsequent Metastases	Dead of Cancer	Well Three Years or More	Absolute Three-Year Survival
Without metastases on admission	Surgery	23	1.9 cm.	2	1	1	3	18
	Curietherapy	6	1.9 cm.	1	..	..	5	5
	Roentgen therapy	45	3.0 cm.	7	4	2	35	77%
	Palliation	2	6.2 cm.	..	..	2	..	..
	Abstention	1	2.5 cm.	..	..	1	..	..
TOTAL		77	...	10	5	3	58	78%
With metastases on admission	Subtotal dissection	12	...	2	..	..	4	6
	Radical dissection	4	...	..	..	..	2	2
	Palliation	3	...	..	..	..	3	..
	Abstention	7	...	..	..	..	7	..
TOTAL		26	...	2	..	..	16	8
GRAND TOTAL		103	...	12	..	..	24	66
								65%

such a large proportion of deaths from intercurrent diseases vitiates the appreciation of results through the three-year survival rate. Very few patients actually died of, or with, cancer: the results are best appraised through evaluation of failure to control the primary lesion or the metastases.

In patients without metastases on admission, the chances of success in the treatment of the primary lesion proved to be closely related to its size. In 306 patients with primary lesions measuring less than 2 cm. in diameter, the results were highly satisfactory: there was a total of 7 recurrences and 17 subsequent metastases, with only 5 deaths with cancer (Table I). Provided that they are practiced with proper skill, all forms of treatment are rather successful in the treatment of small lesions; this justifies our preference for surgery, since it is both effective and expeditious.

In 192 patients with lesions extending from 2 to 12 cm. in diameter, there were 18 recurrences and 22 subsequent metastases with 18 patients dead with cancer. The majority of these extensive lesions received roentgen therapy: only a few of moderate dimensions were treated by surgery. The proportion of recurrences and metastases appeared related to the size and the lack of differentiation of the tumors, but the esthetic results were much better with roentgen therapy.

Further subdivision of the groups according to size proved fruitless in cancers under 2 cm. and impractical in the larger lesions.

#### PATIENTS WITH METASTASES

The curability of patients with metastases on admission was relatively high: of a total of 33 patients (counting 10 who received no treatment or palliative treatment only) 12 (38 per cent) were cured. More than half of the patients operated upon were cured, with a definite advantage for the group with radical neck dissection (Table II).

In the patients without ostensible metastases on admission, in whom metastases later developed, a similar result was obtained: in a total of 39 such cases (counting 8 cases without treatment, or palliative treatment only), the disease was controlled in 18 (46 per cent); more than half of the patients operated upon were cured, with a slight advantage for those who received radical dissection.

In the total of 72 patients who had metastases either on admission or later, the cancer was controlled by surgery in 30 (41 per cent).

#### RECURRENCES FROM TREATMENT ELSEWHERE

The patients who apply for treatment of recurrences must be considered separately.

Unless they are segregated, a false impression of the degree of malignancy, of the metastasizing ability, of the frequency of recurrences, of the proportion of metastases, of the treatment of choice, and of the final results may be acquired.

In a total of 103 patients admitted with recurrent carcinomas of the lower lip following treatment elsewhere, there were 26 (25 per cent) with metastases, a proportion four times as great as that observed in those who had received no previous treatment. The curability of this group of patients was also inferior to the other group (Table III).

#### SUMMARY

1. Carcinomas of the lower lip are frequently highly differentiated and curable,

with a relatively low proportion of metastases.

2. Primary lesions measuring less than 2 cm. are curable by all methods, provided these are adequately applied. Surgery is preferable because it is expeditious.

3. Roentgen therapy is the treatment of choice for lesions measuring 2 cm. or more, because it is more flexible and yields the best esthetic results.

4. The treatment of choice of cervical metastases is a radical neck dissection. Prophylactic neck dissection is not advocated as a routine procedure.

5. Patients presenting recurrences following adequate or inadequate treatment have a larger proportion of metastases and constitute a serious problem.

2200 N. Cascade Ave.  
Colorado Springs, Colo.

#### SUMMARIO IN INTERLINGUA

#### Le Tractamento de Carcinoma del Labio Inferior

Isto es un studio del resultados trienne in 531 consecutive casos de previamente non tractate carcinoma del labio inferior, vidite inter 1940 e 1953. Un altere serie de 103 recurrentias post tractamento alterubi es reportate separatemente.

Carcinomas del labio inferior es frequentemente altemente differentiate e curabile. Le proportion de metastases es basse. Lesiones primari de dimensiones de minus que 2 cm es curabile per omne methodos, providite que istos es applicate adequaremente. Tamen, le metodo chi-

rurgic es preferibile proque illo es le plus expeditive. Roentgenotherapy es le tractamento de election pro lesiones de dimensiones de 2 cm o plus proque illo es le plus flexibile e produce le resultatos le plus esthetic. Le tractamento de election in casos de metastase cervical es un dissection radical del cervice.

Recurrentias post tractamento adequate o inadequate habeva un plus grande proportion de metastases que le casos que non habeva recipite ulle previe attention therapeutic.

(*For Discussion of this paper, see page 848*)

Rad

T  
ir  
irradi  
minds  
radiol  
ress i  
decade  
abilit  
doses  
conne  
two  
radiat  
Ba  
2,000  
and  
thera  
week  
witho  
he co  
tum  
struc  
wise  
the  
He a  
bette  
scop  
exten

O  
Bach  
expe  
surg  
volt  
in S  
Unio  
sele  
epit  
pha  
radi  
irra  
fere  
flo  
tha  
to r

1 P  
Calif  
Ill.,

## Radical Preoperative Roentgen Therapy in Primarily Inoperable Advanced Cancers of the Head and Neck<sup>1</sup>

FRANZ BUSCHKE, M.D., and MAURICE GALANTE, M.D.

THE MISCONCEPTION of the prohibitive risk of major surgery in heavily irradiated tissues is still prevalent in the minds of many surgeons and even of some radiologists. The most significant progress in radiation therapy during the last decade or two consists perhaps in our ability to introduce high cancerocidal doses with preservation of the vascu- connective tissues by the judicious use of two modalities: longer protraction and radiation of shorter wave lengths.

Baclesse (1) has recently reviewed some 2,000 epitheliomas treated between 1919 and 1950 with medium-volt roentgen therapy protracted between two and twelve weeks. By using this modality alone, without the advantage of higher voltages, he could increase the differential between tumor vulnerability and that of normal structures sufficiently to bring some otherwise incurable advanced carcinomas within the realm of curative radiation therapy. He also emphasized that, because of the better protection of normal tissues, the scope of preoperative irradiation could be extended considerably.

On the basis of earlier observations of Baclesse and our own previously reported experiences with well tolerated major surgical procedures following heavy super-voltage irradiation at the Swedish Hospital in Seattle (2), we began last year at the University of California Hospitals to select a number of patients with advanced epitheliomas of the oral cavity and oral pharynx for a planned combination of radical surgery with radical preoperative irradiation. The lesions represented differentiated epitheliomas of pillar, palate, floor of the mouth, and gingiva, of a type that can be expected to infiltrate locally or to remain limited to the regional lymphatic

areas for a long time, but too extensive for complete removal by primary surgery and either too differentiated or too invasive into bone, muscle, or lymph nodes for control by radiation therapy alone. The aim of this combined procedure is to increase the surgical margins of uninvolved tissue by carrying the dose high enough for control of the peripheral portion of the tumor but without attempting to sterilize the more resistant central portion or those areas which, because of bone or deep muscle involvement, could not be controlled. With this emphasis on sterilization of the peripheral portion of the disease, the fields should be sufficiently large. We did not, of course, follow Baclesse's technic of gradually decreasing the field size, since we were not particularly concerned with the control of the central region.

Radiation therapy was given at one million volts (3.2 mm. Pb h.v.l.) through a single field. The dose varied between 6,000 and 8,000 r (skin) in thirty-two to fifty-nine days, for a minimal tumor dose (calculated at the most distant edge of demonstrable involvement) of 4,100 to 6,500 r. One patient in this group with a lesion too extensive to permit determination of the origin was treated by Dr. Robert S. Stone with the 70 Mev synchrotron with a homogeneous dose through the involved volume of 6,000 r in forty-three days. No attempt was made in these cases to include the nodes, palpable or not, unless they happened to be in the field used for irradiation of the primary tumor.

Surgery was done from one to five and one-half months after completion of irradiation. The time depended on the observed response of the tumor during and following therapy, but the interval should,

<sup>1</sup> From the Departments of Radiology and Surgery, University of California School of Medicine, San Francisco, Calif. Presented at the Forty-fourth Annual Meeting of the Radiological Society of North America, Chicago, Ill., Nov. 16-21, 1958.

TABLE I: TEN CASES OF CARCINOMA OF HEAD AND NECK

Patient	Location	ri	Skin	Minimum Tumor Dose (r)	Treatment (days)	Field Size (cm.)	Date of Surgery	Interval Between Radiation and Surgery (mo.)	Surgical Complications	Microscopic Tumor in Specimen	Primary Lymph Nodes	Type of Surgery*
1. McF	Gutter	6,100	5,000	39	8 1/2 X 8	5/1/57	1 1/2	None	None	0	0	L
2. F	Pillar	7,550	4,500	53	9 X 7	9/18/57	2 1/2	None	None	0	0/37	C
3. B	Floor	7,000	5,700	47	7 X 7	5/9/58	2	Minimal	Minimal necrosis, skin; minimal edema, more fibrosis at operation.	+	1/43	C
4. H	Floor	7,300	6,500	65	8 X 10	5/17/58	1	None	None (more fibrosis at operation).	+	1/17	C
5. G	Node	7,000	4,800	49	10 X 8	7/25/58	5 1/2	3 X 4 cm. skin necrosis, grafted; mucosa healed well.	3 X 4 cm. skin necrosis, grafted; mucosa healed well.	0	0/23	C
6. V	Pillar	?	Synch.	6,000	43	8 1/2 X 10	4/28/58	3	3 X 4 cm. skin necrosis, grafted; mucosa healed well.	0	0/53	C
7. B	Pillar	7,000	4,900	59	9 X 8	...	...	...	...	...	...	Exploratory.
8. D	Pillar	7,000	4,100	32	9 X 9	...	...	...	...	...	...	Death 2 months postsurgery.
9. E	Palate	4 1/2	4,000	66	8 X 8	8/15/58	1	Deep positive biopsy. Surgery abandoned.	...	...	...	None. Well seventeen months.
10. F	Tonsil	7,300	5,500	55	10 X 7	5/13/58	5	Positive lower nodes. Surgery abandoned.	...	...	...	Recurrent in tongue.

\* C.

Combined procedure, including radical neck dissection (Commando).

L. Limited excision, including resection of mandible.

NOTE: As of November 1959 Patients 1, 2, 3, 5, 6, 7 and 8 remained without recurrent active disease; Patient 4 died of carcinoma of the bladder developed in April 1959. Patient 9 was still alive with active disease. In Patient 3 an independent papillary carcinoma

was found in the thyroid in September 1958 and is symptom-free to date.

Regrettably, Patient 5 died of carcinoma of the rectum in April 1959. Patient 6 died of carcinoma of the rectum in April 1959. Patient 7 was treated for carcinoma of the thyroid in September 1958 and is symptom-free to date.

if possible, not exceed two to three months because of the progressing vascular and fibrotic changes. A combined operative procedure (so-called "Commando operation") was employed, whereby the primary lesion was removed *en bloc* with the cervical nodes, so as to obtain a continuous specimen which included tongue, tonsillar pillars, floor of the mouth, hemimandible, and the contents of a homolateral radical neck dissection.

Between February 1957 and February 1958, 9 patients were accepted for the planned procedure (Table I). In 6 instances the treatment was completed as originally intended. In 2 patients (advanced carcinomas of tonsillar pillar, Cases 7 and 8), the tumor regression was sufficient to warrant anticipation of possible control by irradiation alone, and surgery was abandoned. To date these patients have remained well for eighteen and ten months, respectively. In 1 patient (Case 9) surgery was abandoned because, on re-examination under anesthesia, one month after irradiation, biopsy through an apparently superficial remaining ulceration in the palate showed deep infiltration which would have made operation futile.

One patient with carcinoma of the tonsil (Case 10) is added in whom originally no surgery was planned, since we consider true tonsillar carcinoma—in distinct contrast to cancer of the pillar—unsuitable for this type of operation because of the biological character of this less differentiated epithelioma with its more widespread lymphatic extension. The patient was explored five months after irradiation because of a small recurrence on the adjacent portion of tongue; there were no palpable nodes. Disease in a retroclavicular node was demonstrated on frozen section, and surgery was given up as futile. The patient died two months later of mediastinal disease.

Regarding the final results, no conclusion is possible at this time. We can state only that thorough examination of the surgical

specimens in 3 patients seemed to indicate that the surgical excision was far beyond histologically demonstrable disease and that, in the 3 others, active disease was not demonstrable in the primary site or in lymph nodes.

The main purpose of this premature discussion, however, is to emphasize again the possibility of radical surgery in previously irradiated tissues. In spite of the heavy preoperative irradiation, there were no surgical complications in this small group of patients beyond those associated with this type of surgery when done initially. No fistulas occurred. In the patient who was operated on five and one-half months after completion of radiation therapy, more fibrosis of the fascial planes was noticed than in patients operated on after two to three months, but healing progressed satisfactorily in this case also.

This presentation demonstrates again that surgery and radiation therapy are not competitive or mutually exclusive. The well planned utilization of both disciplines can be of great help in the management of properly selected cases. But the most important single prerequisite for this kind of radical management is complete mutual understanding and continuous close co-operation between surgeon and radiotherapist in planning prior to treatment and throughout its entire course, with repeated re-evaluation of the response of the disease and of the tolerance of normal tissues, and corresponding adjustment of the original plan during and following irradiation.

University of California Medical Center  
San Francisco 22, Calif.

#### REFERENCES

1. BACLESSE, F.: Clinical Experience with Ultra-Fractionated Roentgen Therapy. [In] *Progress in Radiation Therapy*, edited by F. Buschke. New York, Grune and Stratton, 1958, Chapter 6.
2. BUSCHKE, F., CANTRIL, S. T., AND PARKER, H. M.: *Supervoltage Roentgentherapy*. Springfield, Ill., Charles C Thomas, 1950.

(For Summary in Interlingua and Discussion, see following page)

## SUMMARIO IN INTERLINGUA

Roentgenotherapy Preoperatori Radical in Primariamente Inoperabile  
Canceris Avantiate de Capite e Cervice

Sex patientes con avantiate epitheliomas del cavitate oral e del pharynge oral esseva tractate per un planate combination de chirurgia radical con irradiation preoperatori radical.

Roentgenotherapy esseva administrate a un million volts (con un spissitate de medie valor de 3.2 mm de plumb) via un sol campo. Le dose variava inter 6.000 e 8.000 r (al pelle) in inter trenta-duo e cincuenta-novem dies, pro effectuar un dose minimal al tumor de inter 4.100 e 6.500 r. Le operation chirurgic esseva effectuate inter un mense e cinque menses e medie post le completion del irradiation. In illo le lesion primari esseva excidite in bloco de maniera que un sol e continue specimen esseva obtenite le qual includeva

le lingua, le arco palatin, le fundo del bucca, le hemimandibula, e le contento de un radical dissection cervical homolateral. Un precise examine del specimens chirurgic pareva indicar in 3 patientes que le excision chirurgic excedeva per multo le area de histologicamente demonstrabile morbo. In le 3 alteres, morbo active non esseva demonstrabile in le sito primari o in le nodos lymphatic.

Le resultatos in iste gruppo de casos demonstra le possibilite de chirurgia radical in previemente irradiate histos. In despecto del forte irradiation preoperatori, il occurreva nulle complications chirurgic in ultra de illos que es associate con le mesme typo de chirurgia interprendite como mesura initial.

## DISCUSSION

(Papers by del Regato and Sala; Buschke and Galante)

**James W. J. Carpenter, M.D.** (Chicago, Ill.): It is always a privilege to discuss papers by Dr. Regato and Dr. Buschke. The only problem is that I find so little to say, since I always agree with them.

The results Dr. Regato has presented compare favorably with similar reports and are excellent. Several years ago Gladstone and Kerr reported a similar series with 74.2 per cent five-year survivals in 519 patients. In many of their cases, however, the diagnosis was made only on a clinical basis.

I agree with Dr. Regato on the place of the radical dissection. It should not be a routine measure. One should watch the patient carefully and do the dissection when suspicious nodes are found.

Of course, the care of the patient is most important. I would like to raise one point. Since the lesion must always be contaminated by the oral bacteria, wouldn't the routine use of antibiotics be wise?

Dr. Buschke has given a most important paper. At our institution the head and neck surgeons have finally found that they can operate without too much trouble following properly administered fractionated radiotherapy.

We have had fewer such patients than Dr. Buschke, and our procedures were not planned in advance, but our time relationships were about the same. This is a useful approach and should be employed more often.

THE  
able  
theles  
and  
thirty  
incon  
of hyp  
may  
height  
probab  
of sti  
sible  
tensi  
repai  
Our  
alert  
the r  
selec  
unde  
series  
in m  
appe  
side  
radi  
the  
emp  
and  
in fa  
diff  
is de  
the  
he  
tion  
vest  
that  
ven  
the  
and  
serv  
diff  
kid

<sup>1</sup> P  
Roch  
Chi  
<sup>2</sup> T

# Pyelography in Renal Disease with Hypertension

Correlation Between Pyelographic Findings and Differential Renal Function Studies<sup>1</sup>

LUCY FRANK SQUIRE, M.D., and JORGEN U. SCHLEGEL, M.D.<sup>2</sup>

**T**HREE IS NO evidence as yet that ordinary "essential" hypertension is curable by any means known to us. Nevertheless, out of a sea of investigative material and conflicting clinical reports in the past thirty years, there has gradually emerged incontrovertible evidence that certain cases of hypertension are related to renal disease, may be curable if recognized before the heightened pressure becomes fixed, and probably depend on relative renal ischemia of still viable parenchyma. It is now possible to select some cases of renal hypertension which are curable by removal or repair of the guilty kidney tissue.

Our object in writing this paper is to alert the radiologist to the limitations of the role he can play in helping the clinician select the salvageable patient. It was undertaken subsequent to studies in a series of hypertensive subjects showing that in many instances the excretory pyelogram appeared normal although function on one side was known to be depressed. The radiologist must realize that, in spite of the fact that excretion of the currently employed opaque materials appears equal and of good density on both sides, he may in fact be looking at two kidneys of very different functional capacity, one of which is doing as much as ten times the work of the other. In reporting such a pyelogram, he may unintentionally imply equal function, leading to abandonment of further investigative studies. Although it is probable that few of us actually rely on the intravenous pyelogram as an index to function, the authors believe that most radiologists and the practicing clinicians whom they serve are unaware of the wide functional difference which may exist between the two kidneys in spite of a normal pyelogram.

## HISTORICAL EVIDENCE THAT THERE ARE SALVAGEABLE PATIENTS

Although Bright (21) in his original article in 1836 recognized the relationship between renal disease and high blood pressure, it was not until almost one hundred years later that Crabtree (22) recorded cases in which a diseased kidney had been removed with consequent relief of associated hypertension. Within two years Ask-Upmark (23) discussed a series of postmortem examinations of hypertensive patients in whom renal disease was found on only one side. Goldblatt's work showing that hypertension could be produced by clamping the renal artery stimulated great interest in the problem. Butler (24) in 1937 for the first time successfully treated hypertension by nephrectomy and recognized it as related to unilateral renal disease. The success of this operation led to an overenthusiastic hope that unilateral nephrectomy might remedy many cases of high blood pressure. In 1948 Homer Smith (3), in a necessarily pessimistic report, reviewed 262 cases of hypertension in which what had appeared to be unilateral renal disease had been treated by nephrectomy with only 19 per cent cure. In spite of this gloomy report it is now possible ten years later to re-assay the entire situation in view of the improved investigative methods at our disposal and a series of insistently courageous articles reporting amelioration of hypertension related to unilateral renal disease in the more carefully selected patient. It now seems clear that the statistics on this subject have been muddled by the large number of nephrectomies performed on patients who cannot have had unilateral disease, or who had been hypertensive for a period long enough

<sup>1</sup> From the Departments of Radiology and Surgery, University of Rochester School of Medicine and Dentistry, Rochester, N. Y. Presented at the Forty-fourth Annual Meeting of the Radiological Society of North America, Chicago, Ill., Nov. 16-21, 1958.

<sup>2</sup> Tulane University School of Medicine, New Orleans, La.

to cause generalized arteriolar changes and a fixed elevation of blood pressure.

In 1956 Smith (4) somewhat amended his earlier opinion, recognizing the fact that the urologist has at his command a cure for hypertension in the removal or repair of a responsible kidney. He also concluded that, although morphologic changes (contraction, pyelonephritis, alteration in size of one kidney, etc.) often indicate a guilty kidney when only the conventional methods of study are employed, many ambiguous cases exist in which finer methods are required. For these cases he recommended that studies include unilateral measurement of filtration rate and renal plasma flow.

One acceptable hypothesis with regard to the etiology of this type of hypertension proposes that an ischemic, or partly ischemic, kidney elaborates a proteolytic enzyme (renin) which reacts or combines with a plasma globulin (hypertensinogen) to produce an active pressor substance (angiotonin or hypertensin), a polypeptide, which elevates the blood pressure. From our study of the proved cases of renal hypertension in the literature together with our own, and a review of the surgical findings in each, it seems probable that relative renal ischemia may be caused in a number of ways. Congenitally defective blood supply with aberrant arteries of different sorts, renal artery embolus, thrombosis and infarct, intimal proliferation causing narrowing of the vessel, atherosclerotic plaques, aneurysm of the renal artery not infrequently associated with ptosis of that kidney, and fibrosis about the renal pedicle resulting from renal trauma have all been described repeatedly in salvaged patients. Pyelonephritis is also clearly related to the condition and perhaps causes a secondary decrease in vascularity of viable renal parenchyma.

Careful selection of the salvageable patient can immeasurably aid our understanding of the means by which the ischemic kidney produces hypertension. Kidneys removed from patients in whom hypertension is ameliorated should be

studied exhaustively by the pathologist, with painstaking dissection of the arterial supply, radiography of the injected specimen, and careful microscopic study. Up to now, conscientious reporting of both successes and failures in this sphere seems to indicate that failure is related either to delay in surgical intervention, hypertension having become fixed at a period of from four to twelve years prior to the investigation of the renal picture, or to the existence of unrecognized bilateral disease.

#### DELINeATION OF THE SALVAGEABLE PATIENT

In 1952 Perera and Haelig (5) reported a series of 20 patients with unilateral renal disease cured of hypertension by nephrectomy, together with another group of 20 patients in whom elevated blood pressure readings had persisted after surgery. By reviewing the clinical features of those cases in which the procedure had been successful, they were able to pinpoint the characteristic history of those amenable to surgical cure. They found that in these the course of the disease was likely to have been rapid and dramatic, with sudden onset, and that the hypertension could usually be shown to be of short duration. The patients had in many instances a relatively recent record of being normotensive. Headaches, retinopathy, and a high diastolic pressure were common. Although generally these patients had no previous history of hypertension, several cases seemed to be superimposed on a pre-existing benign or "essential" hypertension. The findings included a relatively high incidence of recent trauma to the abdomen or flank, episodes of abdominal or flank pain, a known source of emboli, and a history of renal disease, particularly pyelonephritis. Fifteen of the patients were under forty-two (75 per cent), but no age group was immune.

Various investigators have shown that in such patients the usual function studies employing bladder urine are worthless. Inasmuch as it is common for the good kidney to compensate for the failing func-

tion of the other, phenolsulfonphthalein clearance determined with bladder urine and other tests of this character may be entirely within the normal range. Microscopic examination of bladder urine is often normal, nor are blood chemistry values usually altered in the salvageable patient. Smith has stressed the fact that total excretory function is suspect as a diagnostic procedure because contralateral hypertrophy may compensate for unilateral malfunction.

It goes without saying that tagging the guilty kidney is the crux of the problem. Obviously in any case in which there are morphologic changes on one side, conventional intravenous and retrograde pyelography will be of value in the clinical assay of the patient. Alteration in kidney size or an advanced degree of pyelonephritis will usually be apparent from the intravenous pyelogram. In those cases, however, with a compromised renal blood supply and no morphologic changes, abnormalities are not likely to be demonstrable by intravenous pyelography, and the radiologist must report that excretion of the medium is equal and adequate on both sides, and that the draining structures appear normal. Poutasse and Dustan (13) have emphasized that the intravenous pyelogram may show an entirely normal picture in patients with obstructive arterial lesions.

Since, in the presence of an entirely normal intravenous pyelogram, there is no other way of knowing that vascular abnormalities are present, the young patient with malignant hypertension must be considered inadequately investigated unless aortographic studies are performed. In various hands aortography has demonstrated in this type of patient the presence of arteriosclerotic plaques, stenotic narrowings of the renal arteries with post-stenotic dilatation or aneurysm, anomalous arterial supply to the diseased kidney showing a striking decrease in the normal arborization of vessels throughout the parenchyma, obstruction of a part of the renal vascular tree from thrombosis and embolus, and

blocking of the arterial supply by post-traumatic fibrosis about the renal pedicle.

Poutasse and Dustan (13) have reported their findings in 104 selected patients in whom aortography was helpful in delineating the salvageable patient. They indicate three points as a basis in selecting patients for that procedure. They believe, first, that any hypertensive patient, regardless of age or duration of disease, who shows unexplained disparity in size or function of the two kidneys by intravenous urography, should be studied by aortography. They stress the fact that disparities in kidney length of as little as 1 or 2 cm. or slight delay in the appearance of radiopaque medium on one side may indicate renal arterial occlusive disease. They state that as a general rule a kidney shown by intravenous urography to be nonfunctioning, although it appears anatomically normal on the retrograde pyelogram, can be considered to have some type of obstruction of its vascular supply. Secondly, they feel that aortography is indicated in young patients, including children, who have unexplained hypertension. A third group in which aortography is recommended consists of older persons with sudden development of accelerated or malignant hypertension. They suspect that in these patients the malignant hypertension has been superimposed on a chronic benign hypertension as a result of some secondary cause related to vascular supply to the kidneys.

Inasmuch as aortographic findings are sometimes equivocal and difficult to interpret, and since there are some patients in whom aortography is clearly contraindicated for clinical reasons, differential function studies with catheters in both ureters may be employed as an index to renal function on the two sides. This procedure often indicates the diseased kidney in the absence of abnormality demonstrable either by intravenous pyelography or on the aortogram. Clearance methods of value in this type of examination include measurement, on the two sides of inulin clearance (as an index to glomerular filtration

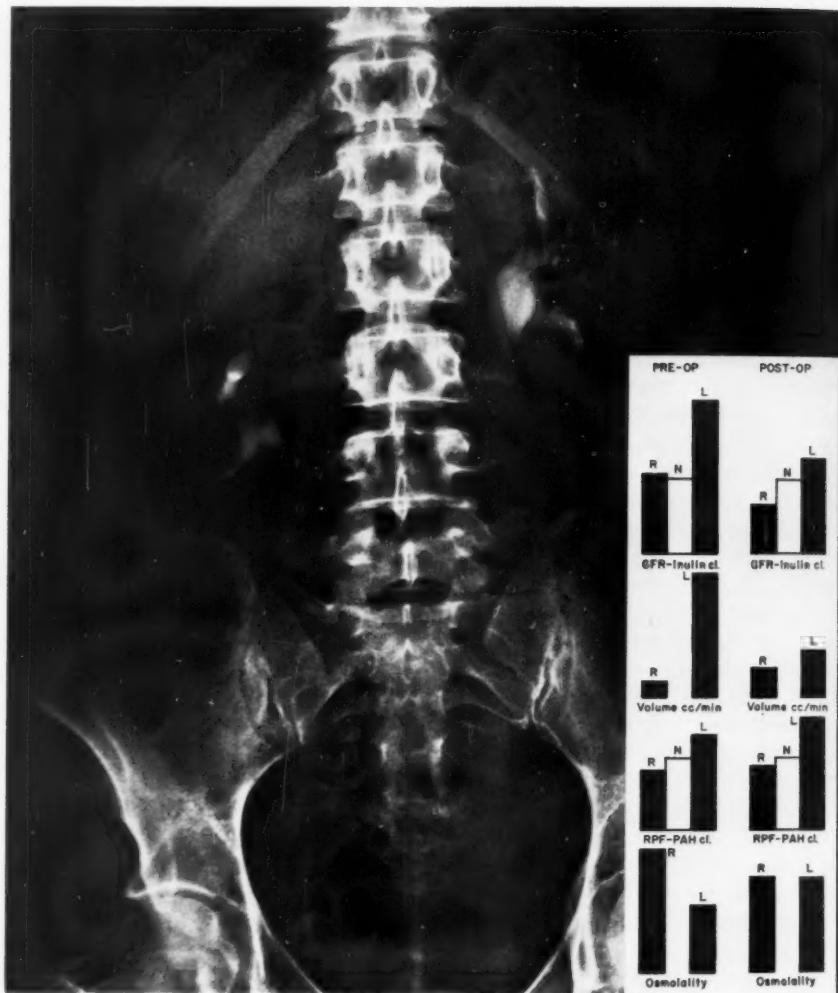


Fig. 1. Case I. Hypertension in a young woman with pronounced nephroptosis. Function tests demonstrated striking depression of function in spite of good pyelographic density of opaque medium on the ptotic side. The aortogram showed right renal aneurysm which was confirmed at surgery (nephropexy and reconstructive arterial shunt graft). Postoperative function tests showed improvement. See also Fig. 2.

rate), volume in cubic centimeters per minute, and Diodrast or para-aminohippuric acid (PAH) clearance (renal plasma flow). The validity of these procedures as an index to renal function is well recognized (1).

In this paper we shall include 6 cases (I-VI) of hypertension in young persons with unilateral renal disease proved at surgery in whom (a) aortography was only some-

times helpful, (b) intravenous urography was misleading because the results were almost uniformly normal, (c) differential renal function studies clearly showed the side on which renal disease existed. Correlation of renal function tests with the appearance of the pyelograms in 17 hypertensive patients has served to confirm our feeling that excretory pyelography may be very misleading.

In  
on a  
paqu  
but ?  
This  
sativ  
ten,  
inal  
the  
fore  
min  
stan  
with  
I  
ear  
tipp  
A N  
ing  
By



Fig. 2. Case I (see Fig. 1). Aortogram. Arrow shows aneurysm of right renal artery.

#### METHOD

Intravenous urography was carried out on all our patients with 50 per cent Hydopaque. The dose was determined by weight, but 30 c.c. was the usual dose for an adult. This was injected following suitable sensitivity tests, and films were made at five, ten, fifteen, and twenty minutes. Abdominal compression was applied following the five-minute film and removed just before the fifteen-minute film. The twenty-minute film was made with the patient standing if his condition warranted it, and with the table tilted if he was too ill to stand.

Differential kidney function tests were carried out with a No. 7 whistle- or olive-tipped catheter passed to each kidney. A No. 16 Foley catheter remained indwelling in the bladder during the procedure. By this means any leakage around the

catheters could be detected. In only a few of our cases did this occur, and none of them was included in this study.

One hour after injection of a priming dose of inulin and PAH followed by continuous infusion maintenance, two half-hour clearance tests were run. Because of varying degrees of discomfort and anti-diuresis, urea was given usually as an 8 per cent infusion in normal saline to promote osmotic diuresis. Hydration by mouth was continued.

Two clearance tests of half an hour duration were next done during the phase of osmotic diuresis. Following this, the patient was given an injection of chlorpromazine sufficient to lower the blood pressure (0.2 mg./kg. intravenously over a three- to four-minute period). Immediately afterward, two more half-hour clearance tests were run.

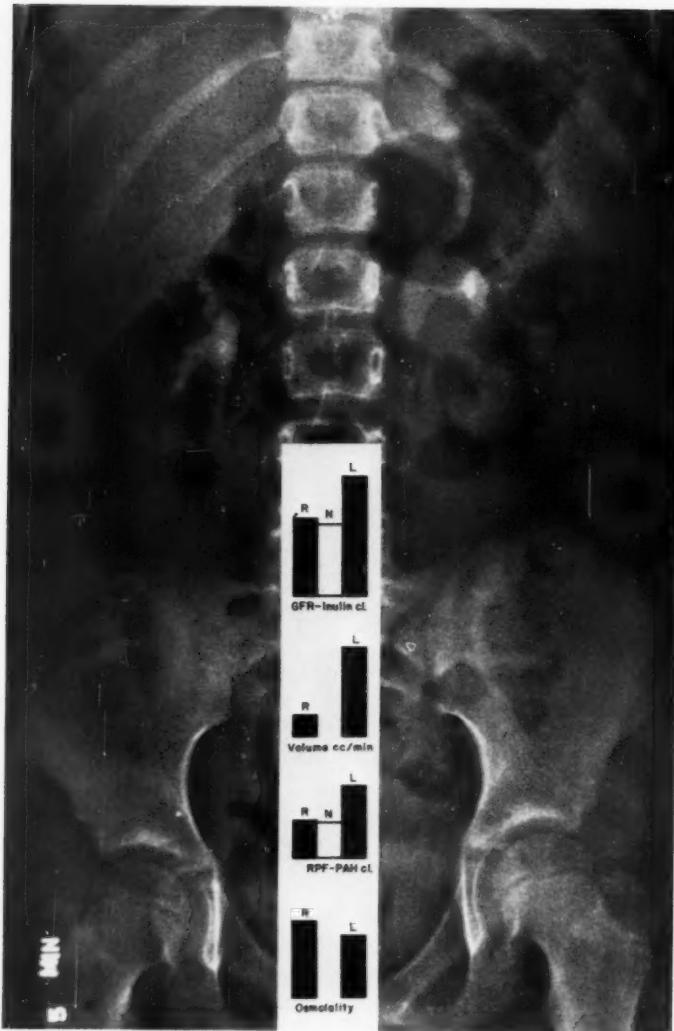


Fig. 3. Case II. Hypertension of sudden onset in a child. Pyelography showed normal density of opaque material, but differential function tests showed depression of function on the right side. The patient has been normotensive since nephrectomy, confirming diagnosis of anomalous and defective right renal circulation.

Inulin was determined by the resorcinol method with alkali treatment modified from Little and described in Homer Smith's *Principles of Renal Physiology* (26). PAH was determined by the method of Bragden and Marshall modified by Smith *et al.* (27). Urine osmolality and serum osmolality were determined on a Fiske osmometer, by the freezing point depression method.

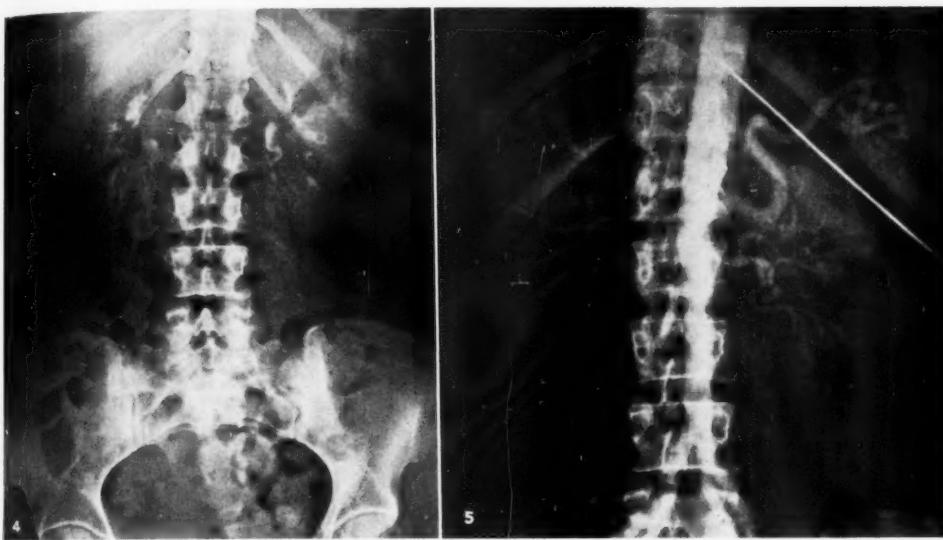
Sodium and potassium determinations were performed on a flame photometer with lithium as an internal standard, and urea and ammonia were determined by the method of Van Slyke and Cullen.

#### CASE REPORTS

**CASE I:** *Right nephroptosis and renal artery aneurysm.* R. K., a 34-year-old female, was known to have had hypertension for five years. Blood pres-

sure was normal. Blood pressure was often elicited on the right kidney on both sides. Red blood cells readmitting from the right kidney functioned normally. The right kidney was carried by a shunt improving at surgery. Postoperative right, maintained normal term pregnancy.

CASE II: B. M., a 10-year-old male, presented with a pressure in the right eye and an eye normotension. He was shown to have a logic normal eye. He was revealed to have a normal eye.



Figs. 4 and 5. Case III. Hypertension of recent onset in a young woman. The pyelogram (Fig. 4) shows normal density (suggestion of pyelonephritis upper pole on right). The aortogram (Fig. 5) demonstrates anomalous circulation on right. Function tests consistently indicated depressed function on right. The patient has been normotensive since the performance of right nephrectomy, at which 4 small renal vessels plus focal chronic pyelonephritis were found.

sure was normal before that time. The admission blood pressure was 226/130. Physical examination was otherwise negative and no renal history was elicited. Intravenous pyelograms showed a ptotic right kidney but normal density of opaque medium on both sides. Antihypertensive therapy was prescribed and the patient was discharged. She was readmitted one year later with blood pressure ranging from 226/130 to 165/105. Differential renal function studies now showed striking depression on the right side. An aortogram revealed an aneurysm of the right renal artery. Surgical exploration was carried out and a nephropexy was performed. A shunt graft placed around the aneurysm resulted in improvement of pulsation in the arteries distal to it at surgery. Repeat function studies two months postoperatively still showed some depression on the right, but the patient was normotensive and has remained so for two years throughout a normal full-term pregnancy.

**CASE II: Anomalous right renal arterial supply.** B. M., an 8-year-old girl, was admitted with a blood pressure measurement of 184/120 discovered during an eye examination. She was known to have been normotensive two months before. The past history was entirely negative. Intravenous pyelography showed equal density on both sides and no morphologic abnormality. Retrograde pyelograms were also negative. Differential renal function studies revealed striking depression of function on the right side. Aortography showed the right kidney appar-

ently supplied by several very small arteries while the left arterial renal circulation appeared normal. Right nephrectomy was performed. No main renal arteries were found, the entire kidney being supplied from a small artery in the lower pole. The patient has remained normotensive for one year postoperatively.

**CASE III: Pyelonephritis plus anomalous right renal arterial supply.** E. B., a 31-year-old woman, gave a history of transient hypertension three years prior to admission. She was known to have had hypertension of 180/110 for seven months. Intravenous pyelography showed good density on both sides but there was some question of deformity of the upper pole on the right. Routine clinical studies were negative except for a bladder polyp and some edema, on cystoscopy. Differential renal function tests four months later showed depression of function on the right. Aortography demonstrated four small arteries supplying the right kidney and a normal left renal circulation. Right nephrectomy was performed and the anomalous character of the circulation was confirmed. Pathological examination showed, also, gross scarring and indentation with focal chronic pyelonephritis. Postoperatively the blood pressure has stabilized at 120/80 for one year at the time of this report.

**CASE IV: Anomalous left renal arterial supply.** C. T., a 36 year old woman, gave a three week history of severe headaches. She was known to have

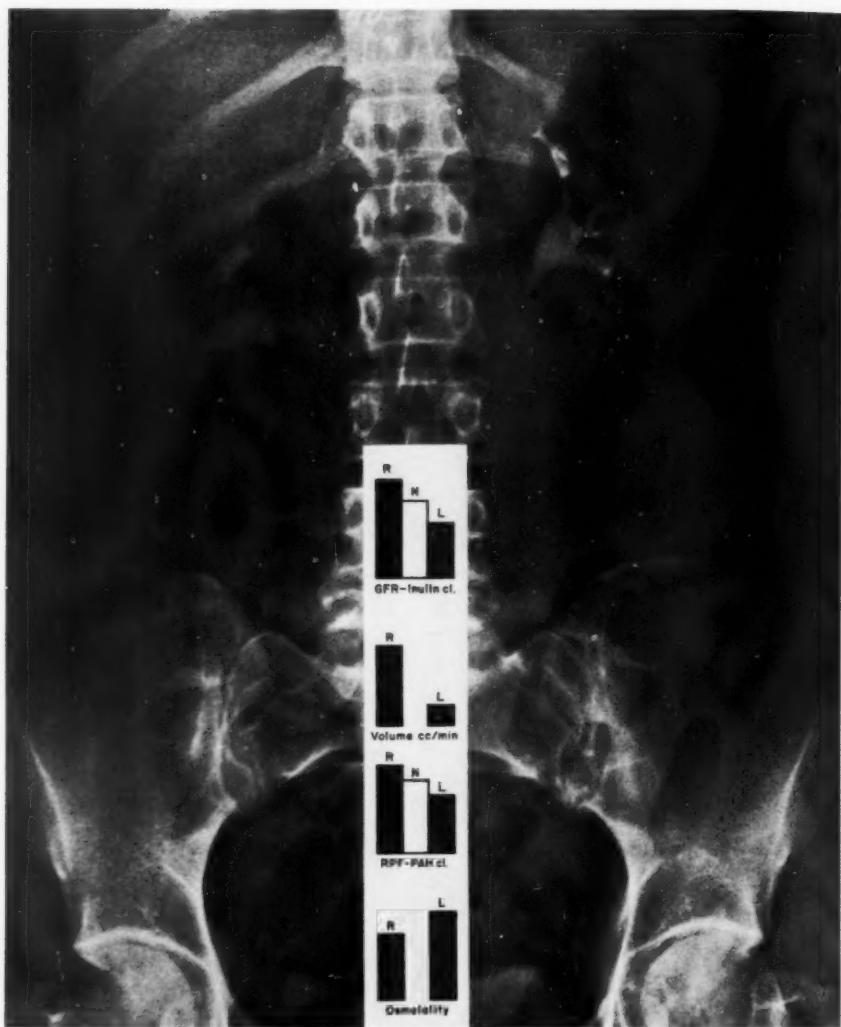


Fig. 6. Case IV. Normal pyelogram; no morphologic indications of disparity of function. The aortogram (Fig. 7) suggests generally decreased vascularity on the left and differential function tests consistently showed depressed function on that side. Surgery confirmed an anomalous blood supply and the patient has been normotensive since left nephrectomy. See also Fig. 7.

been normotensive three months before entering the hospital. Admission blood pressure was 170/110. There were bright red hemorrhages in the eye grounds and some albumin in the urine, but no past genitourinary history. The intravenous pyelogram showed slightly decreased density on the right side but morphologically normal draining structures. The retigene test was negative. Differential kidney function tests revealed decreased function on the left and the patient was discharged on antihypertensive medication. She was readmitted two months later when decreased function on the left was again dem-

onstrated. Aortograms showed normal right kidney circulation but suggested some impairment of the lumen of one of the major branches of the left renal artery and some decreased arterial arborization within the kidney. Surgical exploration of the left kidney showed aberrant arteries of somewhat smaller caliber than normal to the upper and lower poles. Left nephrectomy was performed and the patient has remained normotensive postoperatively for two and one half years. In this case the pyelogram suggested decreased function on the right, but function studies and aortography strongly impli-

cated

left kidney with a present genito-  
vascular function. The left kidney was normotensive later and still is. Aortogram carried out by the



Fig. 7. Case IV (see Fig. 6). Aortogram.

cated the left kidney, removal of which restored the tension to normal levels.

**CASE V: Anomalous arterial supply, upper pole kidney.** G. S., a 25-year-old male, was admitted with a history of hypertension known to have been present for three years. There was no history of genitourinary disease or renal trauma. Admission blood pressure was 180/110 and physical examination was otherwise negative. Differential kidney function tests showed slightly lowered function on the left side although the intravenous pyelogram was normal. The patient was readmitted six months later and a second series of kidney function tests still indicated depression of function on the left. Aortography showed the upper pole of the left kidney poorly vascularized, and surgical exploration was carried out. This revealed an aberrant artery supplying the upper pole of the left kidney while the rest of the organ was supplied by a normal-appearing main renal artery. The upper pole only was resected

and sections taken from it showed normal renal tissue while those from the body of the kidney revealed early arteriosclerosis. The patient became normotensive postoperatively and has remained so for one and one-half years. We believe the slightly ischemic upper pole acting as a "Goldblatt kidney" initiated the hypertension, but, because it was protected by its smaller artery in some way, arteriosclerosis did not develop.

**CASE VI: Trauma; scar tissue constricting renal artery.** B. H., a 22-year-old male, had suffered an injury to the left kidney in an automobile accident eleven years prior to admission. Ten years later pre-employment physical examination showed elevated blood pressure. An intravenous pyelogram revealed no abnormality except for slight distortion of the left renal pelvis. Aortography was equivocal, although it seemed to show some decrease in arterial supply to the left kidney. Differential function studies, on the other hand, clearly indicated de-



Fig. 8. Case V. Hypertension in a young man. Function tests showed consistent slight depression of function on left. The aortogram suggested aberrant arterial supply to left upper pole. Patient has been normotensive since resection of ischemic upper pole of left kidney.

pressed function on the left side. At surgical exploration dense fibrous adhesions were found about the left renal pedicle, with scar tissue replacing the central portion of the kidney and dividing it into two lobes. The blood supply was obviously diminished by encasement in scar tissue and a left nephrectomy was performed. The patient was normotensive postoperatively for a month and a half but has unfortunately been lost to follow-up.

**CASE VII: Atherosclerotic plaque.** M. S., a 39-year-old female, gave a fourteen-year history of hypertension dating from pregnancy with toxemia. She was admitted with a blood pressure of 224/150 and eyegrounds showing tortuous arterioles. Intravenous pyelography showed good density on both sides but the right kidney was somewhat smaller than the left. The differential renal function tests demonstrated definitely decreased function on the right.

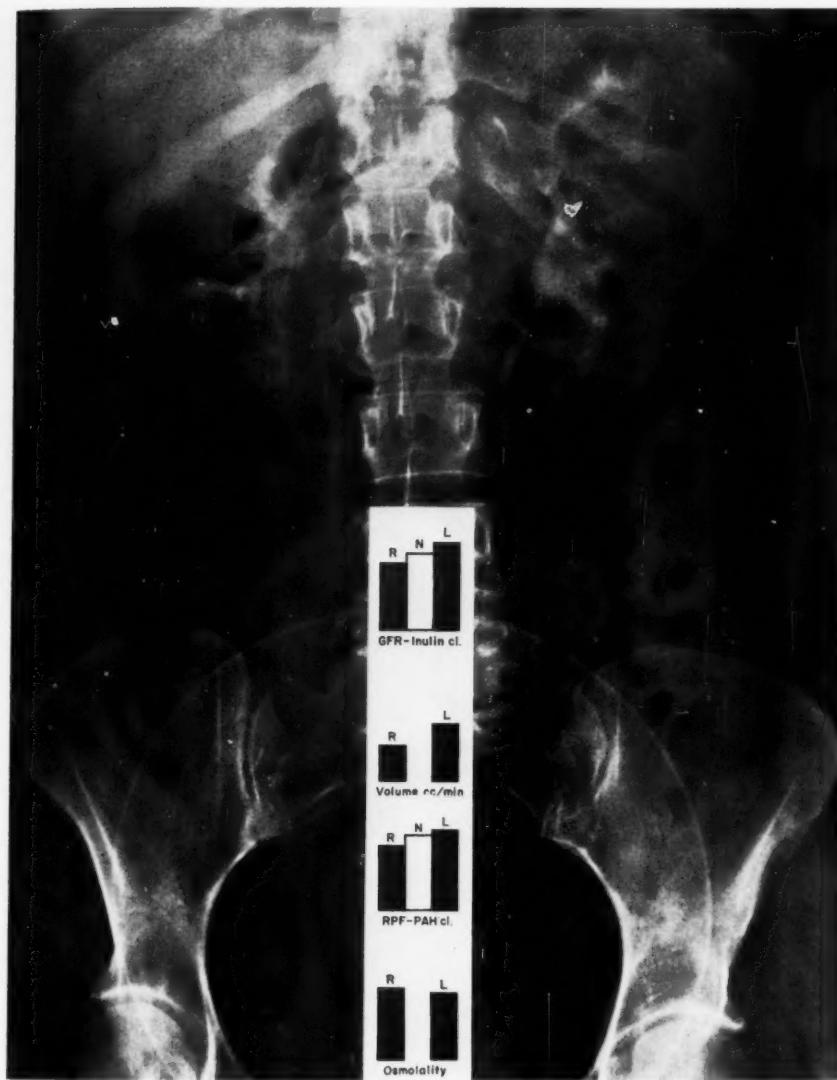


Fig. 9. Case VII. Normal pyelogram in spite of depression of function on the right. Surgery confirmed decreased right renal blood flow, showing large plaque in renal artery. In retrospect, nephrectomy was ill-advised in this patient, in view of a fourteen-year history of hypertension.

Aortography was not performed. At surgery the right kidney was small and the renal artery contained a large atherosclerotic plaque at its bifurcation. A right nephrectomy was performed and microscopic study showed advanced arteriosclerosis. The patient has remained hypertensive at 160/110 and has been placed on antihypertensive drugs. She probably had fixed hypertension at the time of operation, and it is questionable whether surgery should have been attempted.

**CASE VIII: Contracted kidney probably the result of infarction.** V. J., a 40-year-old woman, had rheumatic heart disease with mitral commissurotomy in 1953 and postoperatively a saddle embolus at the aortic bifurcation. She was known to have been normotensive before that time but in the year following operation her blood pressure was recorded as 150/110, and in the three years since operation it had risen to 230/110. She was admitted to the hospital with retinal hemorrhages. An intravenous

pyelogram revealed an abnormally small right kidney which, however, seemed to function and was of equal density to that on the left. Aortography was considered to be contraindicated. Differential kidney function tests showed markedly diminished function on the right, with some depression also present on the left. Since there was bilaterally depressed function, surgery was not thought feasible. It was felt that the hypertension probably resulted from embolization of the right kidney.

**CASE IX: Contracted right kidney, possibly from infarction.** L. D., a 49-year-old female, gave an eleven-year history of hypertension. An episode of sudden right-sided abdominal and flank pain had preceded the hypertensive period. Intravenous pyelography showed a small right kidney. On admission, the blood pressure was 200/150 and there was a 2+ papilledema with exudates and hemorrhages in both fundi. Retrograde pyelography showed a small contracted right kidney. Differential renal function tests revealed almost no function on the right but no compensatory hypertrophy or increased function on the left. Nevertheless, a right nephrectomy was performed and pathologic study of the right kidney showed parenchymal scarring and glomerular sclerosis. Postoperatively the blood pressure did not change and must be considered to have been already fixed at the time of surgery.

**CASE X: Function depressed bilaterally; normal pyelogram.** R. I., a 57-year-old man, had known hypertension for seven years. He was admitted with nonprotein nitrogen of 45. Intravenous pyelography showed normal density of opaque medium and kidney structures on both sides. Aortography was not performed, but the differential renal function tests showed depressed function bilaterally, and the patient was accordingly not considered suitable for an operative approach.

**CASE XI: Function depressed bilaterally, more on the right; pyelogram normal.** H. N., a 48-year-old woman, was known to have been hypertensive for twelve years. She was admitted for study, and intravenous pyelography showed the right kidney to be slightly smaller than the left but with good density of opaque medium on both sides. Aortography was not performed because of a history of one episode of cardiac failure. Differential renal function tests showed depressed function on the right. There was also slight depression of function on the left. The patient was discharged on antihypertensive therapy, surgical remedy not being considered feasible in view of the ten year history of documented hypertension plus bilateral depression of function.

**CASE XII: Depression of function apparently due to pyelonephritis; pyelogram showed good density.** A. G., a 51-year-old woman, gave a history of hypertension for eight to ten years. Intravenous pyelography showed marked blunting of the calyces of the right kidney, especially at the superior pole, with

a normal left kidney. There were persistent 2+ albuminuria and some pyuria. Blood pressure on admission was 210/120. Differential renal function tests showed decreased function bilaterally, more pronounced on the right. The patient was discharged on antihypertensive therapy, not being considered suitable for surgery in view of the lengthy history of hypertension plus bilateral impairment of function.

**CASE XIII: Pyelogram normal in spite of bilaterally depressed function.** D. P., a 35-year-old woman, was known to have been hypertensive for seven years. Admission blood pressure was 190/120 and there were morning headaches, with shortness of breath on exertion. The fundi showed slight arterial narrowing. Intravenous and retrograde pyelograms were normal, showing good excretion of dense opaque medium on both sides and no morphological abnormality. Differential renal function tests showed bilateral decrease of function, more pronounced on the right. Hypertension was not clearly related to unilateral kidney disease, therefore, and a bilateral dorsolumbar sympathectomy was done. The patient became normotensive after surgery, with marked amelioration of her symptoms to date.

**CASE XIV: Unilateral depression of function apparently due to obstructive nephropathy.** In J. D., a 22-year-old man, hypertension was discovered on routine physical examination. Admission blood pressure was 190/115, with the patient otherwise entirely normal. Intravenous pyelography revealed a striking decrease of density of the opaque medium on the right and a retrograde pyelogram showed marked dilatation of the calyces and pelvis on that side. The impression was that of an atrophic right kidney, possibly the result of obstructive nephropathy. Differential tests showed function on the left to be normal while that on the right was strikingly decreased. Surgery was recommended, as it was felt that this case was clearly delineated as hypertension related to unilateral renal disease in a young person. To date the patient has refused operation.

**CASE XV: Unilateral decreased function but normal pyelogram.** M. A., a 29-year-old male, was known to have had hypertension of 170/110 for six years. There had been recurrent bouts of urinary tract infection. The intravenous pyelogram was normal. Both a Diodrast renogram with  $I^{131}$  and differential renal function tests disclosed depression of function on the right. Aortography showed the right renal artery to be somewhat smaller than on the left. The patient is being considered for right renal surgery in spite of his six years of hypertension but to date has not been operated on because of an intercurrent infection.

**CASE XVI: Unilateral nephrophtosis; normal pyelogram.** D. H., a 48-year-old woman, had hypertension of 180/110 with no past history of renal dis-

case. An intravenous pyelogram revealed a right nephroptosis of about 3 inches with the patient standing. The laboratory work-up was essentially negative. Differential renal function studies with the patient lying down showed normal findings on both sides, but, when the table was tilted so that ptosis was produced on the right, there was a pronounced difference, with a drop in function on the right to two-thirds that of the left. In view of these findings, it was considered probable that the circulation of the right kidney was compromised whenever the patient was standing and that hypertension may have been initiated by ischemia as a result of these changes. Nephropexy has been recommended.<sup>3</sup>

CASE XVII: *Normal pyelogram in spite of bilateral depression of function.* In J. K., a 41-year-old male, routine physical examinations over a five-year period showed gradual rise of blood pressure from 120/80 to 180/120, without other symptoms or signs. Intravenous pyelography showed morphologically normal kidney-draining structures and prompt appearance of opaque medium of good and equal density on the two sides. Nevertheless, function studies showed bilateral depression of function, sufficient to contraindicate surgery. Aortography was not performed.

#### SUMMARY OF CASES AND CORRELATION OF PYELOGRAPHIC FINDINGS WITH DIFFERENTIAL FUNCTION TESTS, AORTOGRAPHY, AND SURGICAL RESULTS

Our study was directed toward correlation of intravenous pyelograms with differential kidney function studies in 17 patients. All of the series were hypertensive and were being studied clinically in an attempt to determine whether the hypertension was renal-related, and whether they might therefore be salvaged by nephrectomy or reconstructive arterial surgery on a possibly ischemic kidney on one side. *In all of these patients except 1, excretion of the opaque medium was of good density on both sides in spite of striking unilateral or bilateral depression of function.* In 1 patient (Case XIV), density was strikingly decreased on the guilty side. This was the only patient in whom obstructive nephropathy seemed to be present. In 10 patients the pyelograms were thought to be entirely normal, although unilateral ptosis was present in 2. In 4 of the 17,

various degrees of contracted kidney on the abnormal side were demonstrated: in 2 there was a definite pyelonephritis and in 1 (Case VI) a distortion of the pelvis which proved to be the result of trauma with scarring. In summary, therefore, in 9 of these 17 patients the intravenous pyelographic findings were no index to the fact that unilateral kidney disease existed, while in 7 others there were morphologic changes of various sorts which helped to indicate the responsible kidney, although the density of opaque medium was usually about the same on both sides. In the last patient (Case XVII), pyelograms were entirely normal both as to density of contrast material and morphology of draining structures, in spite of bilateral depression of function.

Aortographic studies were carried out on 8 of the 17 patients. The remainder were not so studied, either because of clinical contraindication or because function tests already indicated bilateral disease. Of the 8 aortograms, 1 was equivocal and 7 were helpful in indicating the guilty kidney.

Differential function studies were of great value in delineating the salvageable patient. In some they demonstrated unilateral disease and the degree of compensation on the contralateral side. They were also of prime value in showing clearly which cases were unsuitable for surgery because of bilateral depression of function.

Six of the 17 patients (Cases I through VI) proved to have hypertension related to unilateral renal disease; in 5 of these nephrectomy was performed with relief of hypertension and they can be considered cured. The sixth is also cured, but after arterial surgery (shunt graft) for correction of an aneurysm, with nephropexy rather than nephrectomy. She has remained normotensive postoperatively. Nephrectomy was carried out in 2 more of the 17 patients, and in these 2 operation must be considered a failure, inasmuch as they remained hypertensive postoperatively. Both patients had a long history of hypertension (eleven and twelve years

<sup>3</sup> Nephropexy has recently been performed on this patient.

respectively), which was probably fixed and should have contraindicated nephrectomy even in the presence of clear-cut unilateral renal disease. Six of the 17 patients were deemed not suitable for operative treatment because of bilateral depression of function, although 1 responded well after a bilateral lumbar sympathectomy. In the remaining 3 patients surgical exploration of what appears to be unilateral renal disease causing hypertension has been recommended. One of these patients has refused surgery, a second is considering it, and the third has not yet recovered from an intercurrent infection.

#### COMMENT

Approximately one-fifth of the plasma is filtered into the glomerular capsules, the glomerular filtrate being a simple ultrafiltrate containing the non-colloid constituents of the plasma. In the tubules almost all the water is reabsorbed, along with many of the other constituents of the filtrate such as glucose, chlorides, etc. Some substances are either not reabsorbed or are only slightly reabsorbed, and others are excreted by the tubules. Among the substances not reabsorbed are inulin and certain organic iodine compounds such as Diodrast and para-aminohippuric acid (PAH). Diodrast and PAH, beside being filtered, are partly excreted by tubular secretion, while inulin is excreted exclusively by glomerular filtration. Hence inulin is used for determination of filtration.

With low plasma levels the blood is almost completely cleared of PAH or Diodrast by one passage through the kidneys, wherefore clearances of these substances can be used for determination of effective renal blood flow. Since the chemical determination of PAH is simpler, it has been used widely as a substitute for Diodrast clearance studies. Recent writings seem to indicate that the excretion of Hypaque is similar to that of Diodrast and PAH, although it may not occur in precisely the same fashion (28, 31-33).

The volume of urine excreted by each

kidney in cubic centimeters per minute is also an important index to the work capacity of that kidney, a reflection of the volume of blood which reaches the kidney per unit time as well as of its water-reabsorbing powers.

Using all the above methods of estimating the functional capacity of the two kidneys separately, and correlating these differential function tests with the appearance of the excretory urogram, we have been struck by the fact that the contrast density of the opaque medium over the renal pelvis cannot be taken as an index to function. In Case IV the contrast density was greater over the kidney which had shown marked depression of function as compared with that over the opposite hypertrophied kidney. The implication of this type of finding, as we see it, is that the kidney with depressed function, and in most instances a compromised or very much reduced renal blood flow, secretes a smaller volume of somewhat more concentrated urine. The compensating kidney, on the other hand, seems to secrete a much larger volume of urine of a lower concentration with the result that its appearance on the pyelogram may be of low density. Correlation of the osmolality of the urine from the two kidneys in this type of case confirms these impressions.

#### SUMMARY

Hypertension due to unilateral renal disease is curable in carefully selected patients provided nephrectomy or reconstructive arterial surgery is undertaken soon enough. Failures are due to unrecognized bilateral disease or fixed hypertension of several years duration resulting in generalized arteriolar changes.

The intravenous pyelogram is not helpful in indicating a guilty kidney in the absence of morphologic changes. The pyelographic findings, blood chemistry, urine, and conventional function studies are often normal in patients with renal ischemia due to some type of arterial obstruction.

Radio reporting may in equal f reassur abandonment truly sa Some is usu following cases normal arteriatio and in constr second Ischemiably in Wh aortog perter kidney both ment per m acid) studi when later also good whic taken

Strong  
Roch  
1. Func  
Unive  
2. Disease  
fully  
1958  
3. Disease  
4. Hypo  
1956  
5. Char  
later

Radiologists must recognize that in reporting a pyelogram as normal, they may inadvertently imply the presence of equal function on the two sides, and so reassure the referring physician that he abandons further function studies on the truly salvageable patient.

Some type of obstructive arterial disease is usually present in these cases. The following have been reported in proved cases in the literature with return of normal tension after operation: aberrant arteries, renal artery aneurysm, obstruction due to embolus, thrombosis, plaques, and intimal proliferation, renal infarct, constriction of arteries in scar tissue secondary to trauma, and pyelonephritis. Ischemia of still viable renal tissue probably initiates the hypertension.

Where no known contraindication exists, aortography should be performed in hypertensive cases in addition to differential kidney function tests with catheters in both ureters and simultaneous measurement of inulin clearance (glomerular filtration rate), volume in cubic centimeters per minute, and PAH (para-aminohippuric acid) clearance (renal plasma flow). Such studies often indicate depression of function on one side in the salvageable patient, when all other means of discovering unilateral renal disease have failed. They also establish the functional state of the good kidney, without a knowledge of which nephrectomy should never be undertaken.

Strong Memorial Hospital  
Rochester 20, New York

#### REFERENCES

1. SMITH, H. W.: The Kidney: Structure and Function in Health and Disease. New York, Oxford University Press, 1951.
2. DUNN, J., AND BROWN, H.: Unilateral Renal Disease and Hypertension. Report of Three Successfully Treated Cases. *J.A.M.A.* **166**: 18-22, Jan. 4, 1958.
3. SMITH, H. W.: Hypertension and Urologic Disease. *Am. J. Med.* **4**: 724-743, May 1948.
4. SMITH, H. W.: Unilateral Nephrectomy in Hypertensive Disease. *J. Urol.* **76**: 685-701, December 1956.
5. PERERA, G. A., AND HAEILIG, A. W.: Clinical Characteristics of Hypertension Associated with Unilateral Renal Disease. *Circulation* **6**: 549-552, October 1952.
6. HOWARD, J. E.: Hypertension Due to Vascular Lesions of One Kidney—Its Significance to Problem of Hypertension in General. *Am. J. Obst. & Gynec.* **68**: 1212-1221, November 1954.
7. WHITE, J. L.: Excretion of Sodium in Relation to Glomerular Filtration in Renal Function. *Transactions of 2nd Conference*, Edited by Stanley E. Bradley. New York, Josiah Macy, Jr. Foundation, 1959, p. 127.
8. HOWARD, J. E., BERTHRONG, M., GOULD, D. M., AND YENDT, E. K.: Hypertension Resulting from Unilateral Renal Vascular Disease and Its Relief by Nephrectomy. *Bull. Johns Hopkins Hosp.* **94**: 51-85, February 1954.
9. BURNS, E.: Unilateral Renal Disease and Hypertension. *California Med.* **79**: 415-419, December 1953.
10. PERERA, G. A.: Transcription of Panel Meeting on Therapeutics: Hypertensive Vascular Disease. *Bull. New York Acad. Med.* **30**: 390, May 1954.
11. SHEA, J. D., SCHWARTZ, J. W., AND KOBILAK, R. E.: Thrombosis of Left Renal Artery with Hypertension: Case Report. *J. Urol.* **59**: 302-306, March 1948.
12. DEMING, Q. B.: Association of Polyuria and Albuminuria with Hypertension of Unilateral Renal Origin. *Arch. Int. Med.* **93**: 197-204, February 1954.
13. POUTASSE, E. F., AND DUSTAN, H. P.: Arteriosclerosis and Renal Hypertension: Indications for Aortography in Hypertensive Patients and Results of Surgical Treatment of Obstructive Lesions of Renal Artery. *J.A.M.A.* **165**: 1521-1525, Nov. 23, 1957.
14. YULE, C. L.: Obstructive Lesions of Main Renal Artery in Relation to Hypertension. *Am. J. M. Sc.* **207**: 394-404, March 1944.
15. POUTASSE, E. F.: Renal Artery Aneurysm: Report of 12 Cases, 2 Treated by Excision of Aneurysm and Repair of Renal Artery. *J. Urol.* **77**: 697-708, May 1957.
16. POUTASSE, E. F., AND DUSTAN, H.: Urologic Causes of Hypertension: Hypertension Due to Renal Artery Lesions. *Cleveland Clin. Quart.* **23**: 3-15, January 1956.
17. EDLING, N. P. G., EDVALL, C. A., HELANDER, C. G., AND PERNOW, B.: Comparison of Urography with Selective Clearance as Tests of Renal Function. *Acta radiol.* **45**: 85-95, February 1956.
18. JOSEPHSON, B.: The Mechanism of the Excretion of Renal Contrast Substances. *Acta radiol.* **38**: 299-306, October 1952.
19. BRAASCH, W. F.: The Surgical Kidney as an Etiological Factor in Hypertension. *Canad. M.A.J.* **46**: 9-15, January 1942.
20. GRABER, I. G., AND SHACKMAN, R.: Divided Renal Function Studies in Hypertension. *Brit. M. J.* **1**: 1321-1326, June 9, 1956.
21. BRIGHT, R.: Cases and Observations Illustrative of Renal Disease Accompanied with Secretion of Albuminous Urine. *Guy's Hosp. Rep.* **1**: 338, 1836.
22. CRABTREE, E. G.: Stricture Formation in Ureter Following Pyelonephritis of Pregnancy. *J. Urol.* **18**: 575-585, November 1927.
23. ASK-UPMARK, E.: Über juvenile maligne Nephrosklerose und ihr Verhältnis zu Störungen in der Nierenentwicklung. *Acta path. et microbiol. scandav.* **6**: 383-442, 1929.
24. BUTLER, A. M.: Chronic Pyelonephritis and Arterial Hypertension. *J. Clin. Invest.* **16**: 889-897, November 1937.
25. WINTER, C. C.: Unilateral Renal Disease and Hypertension: Use of the Radioactive Diodrast Renogram as a Screening Test. *J. Urol.* **78**: 107-116, August 1957.
26. SMITH, H. W.: Principles of Renal Physiology. New York, Oxford University Press, 1956.
27. SMITH, H. W., FINKELSTEIN, N., ALIMINOSA,

L., CRAWFORD, D., AND GRABER, M.: The Renal Clearances of Substituted Hippuric Acid Derivatives and Other Aromatic Acids in Dog and Man. *J. Clin. Invest.* **24**: 388-404, May 1945.

28. HARROW, B. R.: Experiences in Intravenous Urography Using Hypaque. *Am. J. Roentgenol.* **75**: 870-876, May 1956.

29. CONNOR, T. B., BERTHRONG, M., THOMAS, W. C., JR., AND HOWARD, J. E.: Hypertension Due to Unilateral Renal Disease; with A Report on a Functional Test Helpful in Diagnosis. *Bull. Johns Hopkins Hosp.* **100**: 241-276, June 1957.

30. SCHLEGEL, J. U., SAVLOV, E. D., AND GABOR, F.: Some Studies in Renal Hypertension. *J. Urol.* **81**: 581-595, May 1959.

31. MCCHESNEY, E. W., AND HOPPE, J. O.: Studies of the Tissue Distribution and Excretion of Sodium Diatrizoate in Laboratory Animals. *Am. J. Roentgenol.* **78**: 137-144, July 1957.

32. WINTER, C. C., AND TAPLIN, G. V.: A Clinical Comparison and Analysis of Radioactive Diodrast, Hypaque, Miokon and Urokon Renograms as Tests of Kidney Function. *J. Urol.* **79**: 573-579, March 1958.

33. HARROW, B. R.: Hypaque in Intravenous Urography. *Bull. Univ. Miami School Med. & Jackson Mem. Hosp.* **9**: 29-34, March 1955.

#### SUMMARIO IN INTERLINGUA

#### Constatationes Pyelographic in Morbo Renal con Hypertension Correlation Inter le Constatationes Pyelographic e le Resultatos de Tests del Renofunction Differential

Le autores ha correlationate tests de function renal con le constatationes pyelographic in 17 patientes hypertensive. Esseva trovate que le densitate del substantia de contrasto supra le pelve renal non pote esser acceptate como indice de function. In omne le casos, con 1 exception, le excretion del substantia de contrasto esseva de bon densitate a ambe lateres in respecto del presentia de frappante depression functional uni- o bilateral. Aortographia esseva effectuate in 8 inter le 17 patientes. Le resultado identificava le ren responsabile in 7 casos e esseva equivoc in 1. Tests de function differential esseva de grande valor in le demonstration de morbo unilateral e del grado de compensation in le ren contralateral in certe patientes. Illos

monstrava clarmente qual casos esseva non-aptos al tractamento chirurgic a causa de depression bilateral de function. Hypertension relationate con morbo renal unilateral esseva provata in 6 del 17 patientes. Omne iste 6 pote hodie esser considerate como curate: 5 post nephrectomia e 1 post nephropexia con graffo a shunting como correction de un aneurysma.

Si le hypertension non es satis perenne pro haber devenire fixe, illo es curabile in cautemente seligite patientes per nephrectomia o reconstructive chirurgia arterial. Le un o le altere typo de obstructive morbo arterial es usualmente presente. Ischemia de ancora viabile histos renal es probabilmente responsabile pro le initiation del hypertension.



## Clinical Evaluation of Radioactive Chrome Phosphate in the Control of Malignant Pleural and Ascitic Effusions

CHARLES R. PERRYMAN, M.D., D.Sc. (Med.), EDWARD J. PAVSEK, M.D., and JOHN D. McALLISTER, M.D.

MALIGNANT EFFUSIONS are an ever present problem confronting physicians treating patients with far advanced metastatic cancer. During the past eight years several agents have been utilized in an effort at palliation and control of such effusions. The use of radioactive colloidal gold ( $Au^{198}$ ) was reported by Müller (18) in 1949. Chrome phosphate utilizing radioactive  $P^{32}$  was investigated by Jaffe (8) in 1950, and in 1956 Siegel and her colleagues (22) described the use of radioyttrium ( $Y^{90}$ ).

difference has not, however, proved to be significant in clinical application. The colloidal suspension of radioyttrium 90 apparently is less stable than colloidal gold (19).

It would appear that the systemic absorption of none of the compounds is clinically significant. There has been some concern regarding chrome phosphate, but the total amount of radioactive phosphorus in the circulating blood is believed never to exceed 1 per cent of the administered dose, and urinary excretion amounts to approxi-

TABLE I: CHARACTERISTICS OF RADIOACTIVE AGENTS FOR CONTROL OF MALIGNANT EFFUSIONS

Agent	Particle Size	Systemic Absorption	Half-Life (Days)	Beta Energy (Maximum)	Beta Range (Water)	Radiation Hazard
Chrome Phosphate	Variable 0.2-25 micra	Negligible Less than 4 per cent dialyzable	14.3	1.72 Mev	8.0 mm.	Slight
Colloidal Gold	Uniform 0.003-0.007 micra	Negligible	2.69	0.98 Mev	3.8 mm.	Moderate
Radioyttrium	Variable	Negligible	2.54	3.2 Mev	11.0 mm. (tissue)	Slight

Table I compares briefly the characteristics of radioactive agents used for the control of malignant effusions. It is to be noted that chrome phosphate as produced at present shows a wide variation in particle size. In most of the commercially available solutions, however, approximately 85 per cent of the particles measure from 1 to 5 micra. There is experimental evidence that the larger particles are less readily absorbed (5). Radioactive gold exhibits a uniform particle size and is a more stable colloidal solution. Lahr (16) has noted that the deposition of gold 198 on the pleural surface of rats is more uniform than that of chrome phosphate. Furthermore, the clumping which is seen in chrome phosphate solutions has suggested the possibility of uneven irradiation of the pleural or peritoneal cavity. This

approximately 5 per cent in eleven days. It is worthy of note, however, that Root (20) reported a case in which 12 per cent appeared to be present in the liver after intraperitoneal administration.

The longer half-life of chrome phosphate is an obvious advantage in that a constant supply may be kept on hand; a delay of one day in delivery, due to the uncertainties of transportation, is not significant with this isotope. The longer half-life, of course, also allows for more prolonged irradiation of tumor cells. If, however, radiation sickness has occurred, that too may be prolonged.

The maximum beta energy and range are perhaps not significant from the clinical standpoint. The average beta range in tissue is more important. For colloidal gold it is approximately 1 mm., for chrome

<sup>1</sup> From the Department of Radiology, Mercy Hospital, Pittsburgh, Penna. Presented at the Forty-fourth Annual Meeting of the Radiological Society of North America, Chicago, Ill., Nov. 16-21, 1958.

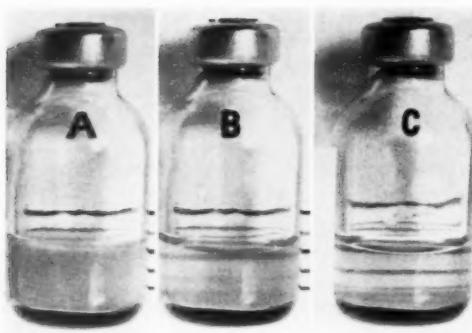


Fig. 1. Bottles of radioactive chrome phosphate. A. Immediately after thorough shaking. Note only lines above solution are visible.

B. One hour later the solution is beginning to settle out and the lines behind the solution are partially visible.

C. Four hours after shaking, the solution is almost completely settled out and the lines behind the bottle are readily seen.

At the end of 4 hours (Fig. 1, C) marked "settling out" has occurred and the lines behind the solution are now quite readily demonstrable. This "settling out" tendency has been disturbing to investigators, but clinical results indicate that the problem is not as serious as anticipated, probably because the transmitted vascular pulsations within the body cavities and the respiratory movements of the thoracic cage and diaphragm are continually agitating the solution and keeping it in a more uniform state.

In choosing the agent which he believes most suitable to control malignant effusions, the physician must consider several factors, some of which are shown in Table II. With radioactive agents it must be remembered that there is some delay in

TABLE II: COMPARISON OF RADIOACTIVE AND CHEMICAL AGENTS USED FOR CONTROL OF MALIGNANT EFFUSIONS

Treatment Agent	Effect on Fluid Formation	Systemic Side-Effects	Effect on Bone Marrow	Cost	Procurement and Handling
Chromic Phosphate	Some delay	Minor	Insignificant	Moderate	Easy
Colloidal Gold	Some delay	Minor	Rare hypoplasia	Expensive	Difficult
Radioyttrium	Some delay	Minor	None reported	Moderate	Difficult
Nitrogen Mustard	Immediate	Cytotoxic, Nausea	Frequent depression	Cheap	Available
Thio-tepa	Immediate	Less cytotoxic	Less frequent depression	Cheap	Available

phosphate 2.5 mm., and for radioyttrium 3.5 mm.

The gamma ray present in colloidal gold has been both praised and condemned. In our clinic we do not feel that the gamma radiation is therapeutically desirable in this application. It contributes significantly to the total-body radiation dose and adds to the difficulties of handling and storage. We prefer to obtain gamma rays from our cobalt-60 unit and have used such combined therapy in several cases.

Solutions of chrome phosphate have a tendency to "settle out" rather rapidly. Figure 1, A shows a solution of radioactive chrome phosphate immediately after thorough shaking. It will be noted that only the lines above the solution are visible. At the end of one hour (Fig. 1, B) the solution already shows "settling out" and the lines behind it are becoming more readily visible.

effect on fluid formation, during which time the radiation reaction is developing. It has been shown that the beta-ray skin reaction requires two to three weeks to develop. During this period it may be necessary for the patient to have one to three additional thoracenteses. Nitrogen mustard and triethylene thiophosphoramide have a more rapid effect, but there is still a delay during which it may be necessary for the patient to have an additional thoracentesis.

The radioactive agents have minor systemic side-effects, such as occasional nausea, which may be reduced with Thorazine or Compazine. Severe pleuritic or peritoneal pain of one to two days duration has been reported in a few patients in whom nitrogen mustard or radioactive gold was the agent (17). The nitrogen mustard compounds may also cause nausea, and they are cyto-

Fig  
on M  
stillia

B.  
rea

C.  
ning  
bone  
thera

toxi  
toxi

to

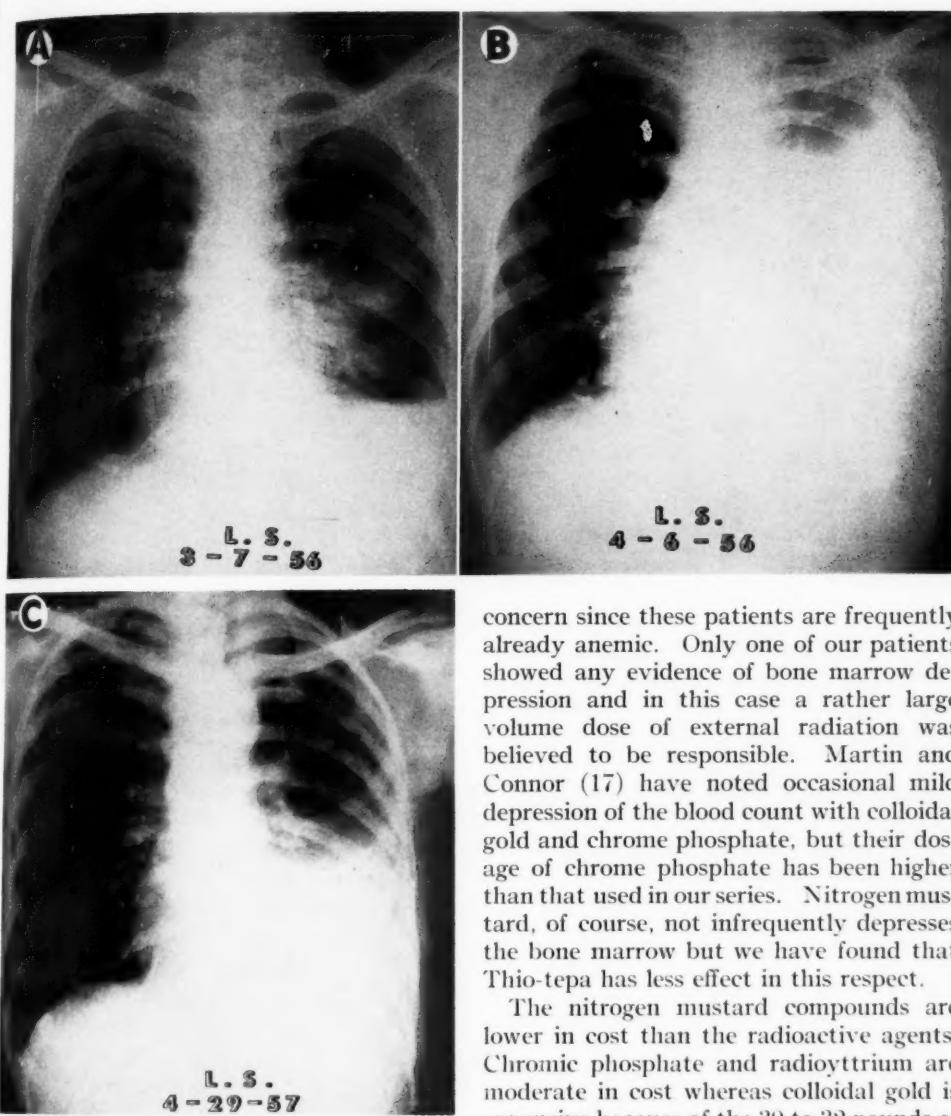


Fig. 2. Case I. A. Chest roentgenograms made on March 7, 1956, six days after thoracentesis and instillation of chrome phosphate.

B. Chest study made on April 6, showing rapid reaccumulation of left pleural effusion.

C. Approximately one year later the chest is beginning to show reaccumulation of fluid and widespread bone metastases. The patient has had no additional thoracentesis.

toxic. Thio-tepa appears to be less cytotoxic than nitrogen mustard and is worthy of further clinical investigation.

The effect on the bone marrow is always of

concern since these patients are frequently already anemic. Only one of our patients showed any evidence of bone marrow depression and in this case a rather large volume dose of external radiation was believed to be responsible. Martin and Connor (17) have noted occasional mild depression of the blood count with colloidal gold and chrome phosphate, but their dosage of chrome phosphate has been higher than that used in our series. Nitrogen mustard, of course, not infrequently depresses the bone marrow but we have found that Thio-tepa has less effect in this respect.

The nitrogen mustard compounds are lower in cost than the radioactive agents. Chromic phosphate and radioyttrium are moderate in cost whereas colloidal gold is expensive because of the 30 to 32 pounds of lead which must be used for protection during shipping. Nitrogen mustard is, of course, readily available. Thio-tepa has been obtainable as an experimental drug and is now generally available. Chromic phosphate is readily obtained and kept on hand because of its long half-life.

No special protective and storing facilities are necessary for chromic phosphate, and only a plastic-shielded syringe is required for its administration.

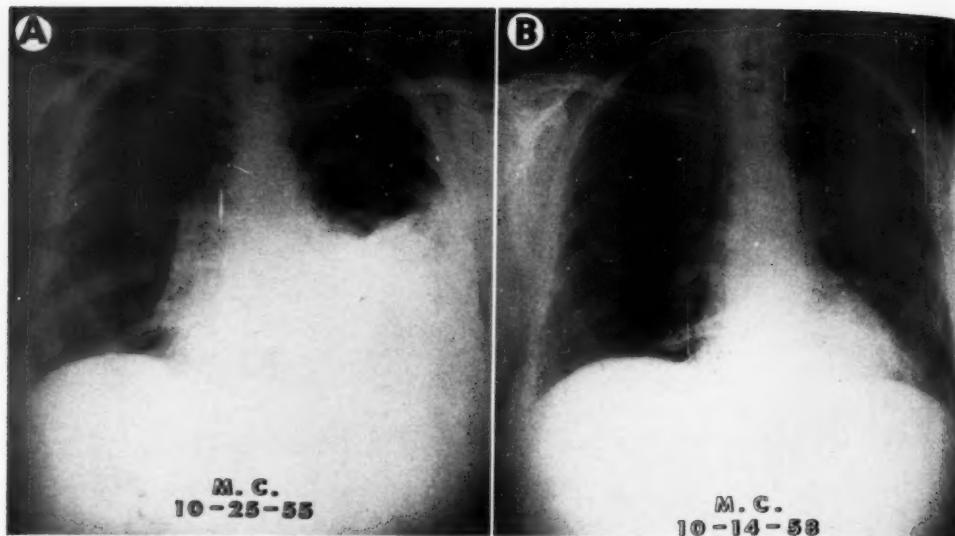


Fig. 3. Case II. A. Chest roentgenogram made on Oct. 25, 1955, showing left pleural effusion in patient with lymphosarcoma.

B. Chest study made three years after instillation of chrome phosphate. There is no evidence of pleural effusion.

Colloidal gold and radioyttrium have a short half-life and are therefore difficult to keep on hand. Because of its gamma ray, colloidal gold requires storage facilities with adequate protection. It is more difficult to handle without exposure to personnel, and special equipment is required for its administration. In the event of an accident, hypochlorite bleach powder must be used for decontamination. Only soap and water are necessary for decontamination of chrome phosphate.

The pure beta-ray emitters, chrome phosphate and radioyttrium, may be administered on an outpatient basis and many of our series were so treated. Thus, in the overall picture it would appear that chromic phosphate is the agent of choice among the radioactive drugs while Thiotepa shows promise among the non-radioactive agents.

#### CASE REPORTS

CASE I: L. S., a 45-year-old woman with metastatic carcinoma of the breast, had a thoracentesis with instillation of 5 millicuries of chrome phosphate on March 3, 1956. There was a moderate amount of residual pleural fluid present (Fig. 2, A). On April 6, her chest roentgenogram (Fig. 2, B) showed evi-

dence of rapid reaccumulation of the pleural fluid and an additional thoracentesis was necessary.

Figure 2, C is a chest study made approximately one year later. No additional thoracentesis has been needed. The bones of the thoracic cage now show extensive metastases and the patient is just beginning to have some reaccumulation of fluid.

*Comment:* This case illustrates the reaccumulation of fluid during the latent period before the radiation reaction is fully developed. We believe it is important that the pleural cavity be as dry as possible three to four weeks following the instillation of the chrome phosphate. With apposition of the pleura, an obliterative fibrous pleurisy may develop and there is thus less chance for reaccumulation of fluid.

CASE II: M. C., a 66-year-old woman with lymphosarcoma, had an initial chest study (Fig. 3, A) on Oct. 25, 1955. A thoracentesis was done on Nov. 4, with instillation of 5 millicuries of chrome phosphate. A follow-up thoracentesis was performed on Nov. 21. The patient has had no additional thoracenteses since that time and three years later (Fig. 3, B) shows no evidence of significant reaccumulation of pleural fluid.

*Comment:* This case also illustrates the advantage of a follow-up thoracentesis.

If ne...  
should...  
of an...  
the pl...

In o...  
active...  
results...  
than c...  
the p...  
believ...  
(Tabl...

TABLE  
CHRO...

Excel...  
Fair...  
Died...  
Unsat...  
plete...  
Known...

since...  
and t...  
whom...  
comp...  
unin...  
these...  
dition...  
peri...  
deve...  
resu...  
peri...  
peri...  
siden...  
nece...  
peri...  
ditio...  
foun...  
siden...  
this...  
prev...

A...  
wi...  
ab...  
pat...  
me...  
wi...  
per...  
lea...

If necessary, constant closed drainage should be used to allow the development of an obliterative pleurisy at the peak of the pleuritic reaction.

#### DISCUSSION

In our series of 60 cases in which radioactive chrome phosphate was used, the results were better in control of pleural than of peritoneal fluid. Fifty per cent of the patients with pleural effusions are believed to have been definitely benefited (Table III). This is an absolute figure,

TABLE III: PALLIATIVE RESULTS OBTAINED WITH CHROME PHOSPHATE IN MALIGNANT PLEURAL AND ASCITIC EFFUSIONS

	Pleural Effusions	Ascitic Effusions
Excellent	12	4
Fair	7	10
Died in less than a month	6	6
Unsatisfactory or incomplete follow-up	19	8
Known to have benefited	13	12
	50 per cent	45 per cent

since those who died in less than one month and those who were lost to follow-up or in whom the follow-up information was incomplete were automatically considered unimproved. It is to be remembered that these patients may require one or two additional thoracenteses during the latent period in which the radiation reaction is developing, and this does not imply a poor result since the patient may go on to a long period of improvement. We do not consider the result fair unless there was no necessity for further thoracentesis for a period of two to four months. If no additional thoracentesis was necessary for four months or longer the outcome was considered excellent. With similar evaluation, this absolute figure is comparable to figures previously reported for colloidal gold (19).

Also shown in Table III are our results with the use of chrome phosphate in the abdomen. Forty-five per cent of the 22 patients showed some evidence of improvement. We are frankly not very impressed with these figures but believe that the low percentage of excellent results may be at least partially due to the low dose of 5

millicuries used in the peritoneal cavity, which has a much larger surface to be treated. Our decision to use the relatively low dose was originally motivated by the settling-out properties of chrome phosphate, the variation in particle size, and the occasional high uptake that had been previously reported in the liver. We now believe, however, that a dose of 10 millicuries should be used in the abdomen and that a dose of 5 to 8 millicuries may be employed in the chest. The higher doses will cause a slight increase in the frequency of mild side-reactions. It is of interest to note that, despite the low doses used in the abdomen, the results are similar to some of those reported by others using colloidal gold (7).

#### SUMMARY

It would appear to us that radioactive chrome phosphate is the agent of choice, in preference to colloidal gold and radioyttrium, in the treatment of malignant effusions. We prefer it to nitrogen mustard because of the generalized cytotoxic effect of the latter preparation. One of the newer nitrogen mustard compounds, *i.e.*, Thiotepa, is worthy of more extensive clinical investigation as a suitable addition to the to the armamentarium of the physician treating patients with malignant effusions.

1400 Locust Street  
Pittsburgh 19, Penna.

#### REFERENCES

1. ANDREWS, G. A., ROOT, S. W., AND KNISELEY, R. M.: Metabolism and Distribution of Colloidal Au<sup>198</sup> Injected Into Serous Cavities for Treatment of Effusions Associated with Malignant Neoplasms. *Cancer* 6: 294-302, March 1953.
2. ANDREWS, G. A., ROOT, S. W., KNISELEY, R. M., AND KERMAN, H. D.: Intracavitary Use of Colloidal Radioactive Gold. *Radiology* 61: 922-929, December 1953.
3. ANDREWS, G. A., ROOT, S. W., KERMAN, H. D., and BIGELOW, R. R.: Intracavitary Colloidal Radio-gold in the Treatment of Effusions Caused by Malignant Neoplasms. *Ann. Surg.* 137: 375-381, March 1953.
4. BONFE, F. J., STORAASLI, J. P., AND WEISBERGER, A. S.: Comparative Evaluation of Radioactive Colloidal Gold and Nitrogen Mustard in the Treatment of Serous Effusions of Neoplastic Origin. *Radiology* 67: 63-66, July 1956.
5. COOPER, J. A. D., AND ZORN, E. M.: Distribution of Colloidal Radioactive Chrome Phosphate After Intracavitary Administration in Rat. *J. Lab. & Clin. Med.* 42: 867-871, December 1953.

6. CRON, R. S., COWAN, I. I., GORTHEY, R. L., AND KARIORIS, F. G.: Surgery and Radioactive Gold Treatment for Carcinoma of the Ovary. *Am. J. Obst. & Gynec.* **70**: 910-917, October 1955.

7. IRETON, R. J., AND ULLERY, J. C.: Management of Ascites with Radioactive Gold. *Surg., Gynec., & Obst.* **103**: 437-442, October 1956.

8. JAFFE, H. L.: Treatment of Malignant Serous Effusions with Radioactive Colloidal Chromic Phosphate (Preliminary Report). Presented before the California Medical Association, Los Angeles, May 1950.

9. JAFFE, H. L.: Interstitial Use of Radioactive Colloidal Chromic Phosphate in Therapy. *Radioisotopes in Medicine*. U. S. Atomic Energy Commission, September 1953.

10. JAFFE, H. L.: Treatment of Malignant Serous Effusions with Radioactive Colloidal Chromic Phosphate. *Am. J. Roentgenol.* **74**: 657-666, October 1955.

11. KEETTEL, W. C., AND ELKINS, H. B.: Experience with Radioactive Colloidal Gold in Treatment of Ovarian Carcinoma. *Am. J. Obst. & Gynec.* **71**: 553-568, March 1956.

12. KENT, E. M., MOSES, C., FORD, W. B., KUTZ, E. R., AND GEORGE, R. S.: Radioactive Isotopes in Management of Carcinomatosis of Serous Body Cavities. *Arch. Int. Med.* **94**: 334-340, September 1954.

13. KING, E. R., SPICER, D. W., DOWDA, F. W., BENDER, M. A., AND NOEL, W. E.: The Use of Radioactive Colloidal Gold ( $Au^{198}$ ) in Pleural Effusions and Ascites Associated with Malignancy. *Am. J. Roentgenol.* **68**: 413-420, September 1952.

14. KNISELEY, R. M., AND ANDREWS, G. A.: Pathological Changes Following Intracavitary Therapy with Colloidal  $Au^{198}$ . *Cancer* **6**: 303-312, March 1953.

15. KLIGERMAN, M. M., AND HABIF, D. V.: The Use of Radioactive Gold in the Treatment of Effusion Due to Carcinomatosis of the Pleura and Peritoneum. *Am. J. Roentgenol.* **74**: 651-656, October 1955.

16. LAHR, T. N., OLSEN, R., GLEASON, G. I., AND TABERN, D. L.: Animal Distribution of Colloids of  $Au^{198}$ ,  $P^{32}$ , and  $Y^{89}$ : An Improved Method of Tissue Assay for Radioactivity. *J. Lab. & Clin. Med.* **45**: 66-80, January 1955.

17. MARTIN, J. A., AND CONNOR, R. B.: Treatment of Malignant Effusions. *Texas State J. Med.* **53**: 21-27, January 1957.

18. MÜLLER, J. H.: Premiers résultats thérapeutiques, obtenus à l'aide de la radioactivité artificielle, démonstration. *Schweiz. med. Wochenschr.* **80**: 437-438, April 29, 1950.

19. QUIMBY, E. H., FEITELBERG, S., AND SILVER, S.: Radioactive Isotopes in Clinical Practice. Philadelphia, Lea & Febiger, 1958.

20. ROOT, S. W., TYOR, M. P., ANDREWS, G. A., AND KNISELEY, R. M.: Distribution of Colloidal Radioactive Chromic Phosphate After Intracavitary Administration. *Radiology* **63**: 251-257, August 1954.

21. SEAMAN, W. B., SHERMAN, A. I., AND BONEBRAKE, M.: Radioactive Gold in the Treatment of Malignant Effusions. *J.A.M.A.* **153**: 630-633, Oct. 17, 1953.

22. SIEGEL, E. P., HART, H. E., BROTHERS, M., SPENCER, H., AND LASZLO, D.: Radioyttrium ( $Y^{90}$ ) for the Palliative Treatment of Effusions Due to Malignancy. *J.A.M.A.* **161**: 499-503, June 9, 1956.

23. STORAASLI, J. P., BONTE, F. J., KING, D. P., AND FRIEDELL, H. L.: Use of Radioactive Colloidal Gold in the Treatment of Serous Effusions of Neoplastic Origin. *Surg., Gynec. & Obst.* **96**: 707-710, June 1953.

24. TAYLOR, L.: A Technique for Intrapleural Administration of Nitrogen Mustard Compounds. *Am. J. M. Sc.* **233**: 538-541, May 1957.

25. WEISBERGER, A. S., LEVINE, B., AND STORAASLI, J. P.: Use of Nitrogen Mustard in Treatment of Serous Effusions of Neoplastic Origin. *J.A.M.A.* **159**: 1704-1707, Dec. 31, 1955.

#### SUMMARIO IN INTERLINGUA

#### Evaluation Clinic de Radioactive Phosphato de Chromo in le Subjugation de Maligne Effusiones Pleural e Ascitic

Radioactive phosphato de chromo es considerate como le agente de election, preferibile a auro colloidal e yttrium radioactive, in le subjugation de effusiones maligne in patientes con avantiatissime canceres metastatic. Illo es a preferite mustarda de nitrogeno a causa del generalisate effecto cytotoxic de iste ultime. Un del plus recente compositos de mustarda de nitrogeno, Thio-tepa, merita un plus extense investigation clinic.

Es opinate que un medietate de 38 patientes con ascites pleural, qui recipieva

instillationes de 5 millicuries de radioactive phosphato de chromo, ha beneficiate ab iste tractamento (12 con resultatos excellente e 7 con resultatos satis bon). Le mesmo valeva pro 10 de 22 patientes con ascites peritoneal qui esseva tractate in le mesme maniera (con 4 resultatos excellente e 6 resultatos satis bon). Super le base de iste lor experientia, le autores nunc crede que le dosage usate esseva troppo micre. Illes recommenda que 10 millicuries es instillate in le abdomen e que un dose de inter 5 e 8 millicuries es empleate in le thorace.

The L

IN 18<sup>th</sup>  
blew  
chest in  
that the  
signs of  
sents the  
any an-  
quota of  
physici-  
ness in  
twenty  
the he

In the  
dioxide  
diagnos-  
Experi-  
heimer  
tively  
the rig-  
without  
Human  
Stauf-  
valves  
the co-  
fer, I  
that  
could  
effusi-

The  
in the  
raphy  
both  
cum-  
ing o  
both  
pres-  
but  
actio  
estab-  
of 1  
card

In  
ear-  
pati

1 P  
Fort

# The Diagnosis of Pericardial Effusion with Intracardiac Carbon Dioxide<sup>1</sup>

JAMES H. SCATLIFF, M.D., ALFRED J. KUMMER, M.D., and ARNOLD H. JANZEN, M.D.

**I**N 1837 CORMACK (1) reported that he blew the contents of his twice-filled chest into the jugular vein of a horse and that the animal exhibited "only moderate signs of uneasiness." This probably represents the first time that the right heart of any animal experienced more than its usual quota of carbon dioxide. Needless to say, physicians have felt considerable uneasiness in the intervening one hundred and twenty years when any free gas arrived in the heart.

In the last two years intracardiac carbon dioxide has been shown to be of definite diagnostic aid in cardiovascular radiology. Experimental animal studies by Oppenheimer *et al.* (2) in 1955 revealed that relatively large amounts of this gas could reach the right heart and pulmonary circulation without producing embolic phenomena. Human application was first carried out by Stauffer (3), who visualized the heart valves and chambers in two infants. In the course of these studies Durant, Stauffer, Paul, and Oppenheimer (4, 5) found that carbon dioxide in the right atrium could be used to differentiate pericardial effusion from cardiac enlargement.

The limitations of plain-film examination in this problem are well known. Kymography may show blunting of pulsations in both entities, and fluoroscopy in the recumbent position may demonstrate widening of the base of the cardiac silhouette in both. Opaque angiography will reveal the presence of surrounding pericardial effusion but carries with it the risk of allergic reaction. Reliance on pericardiocentesis to establish the diagnosis entails the hazard of myocardial laceration and hemopericardium.

In order, therefore, to evaluate the carbon-dioxide method, a series of 22 patients have now been examined by the

authors. It is with the rationale, technic, results, and safety of intravenous carbon-dioxide insufflation that this paper deals.

## RATIONALE

It has been pointed out that carbon dioxide is twenty times more soluble in blood than oxygen or air. This property of the gas allows the formation of a transient gas-blood level and serves as the crux of the method. It may be calculated that small intravenous injections of carbon dioxide, 50 to 100 c.c., alter the carbon-dioxide content of the blood approximately 5 to 10 volumes per cent, and this effect is of only several minutes duration. In this time the change produced in the blood *pH* is insignificant. This amount of carbon dioxide is equivalent to the amount of the gas formed in one minute during minimal exercise, such as eating or turning over in bed.

If a patient is placed in left decubitus (left side down, right side up), carbon dioxide, once in the right atrium, will rise and outline its uppermost surface. In this position the atrium is seen as a hemispherical shadow extending at its summit 4 to 5 cm. above the spine. The opaque shadow or band, as we have come to call it, outlined between the carbon-dioxide bubble and the overlying lung, consists of pleura, pericardium, and atrial wall. Autopsy measurements have shown that the width of these structures in the normal and enlarged heart averages 3 mm. With allowance for x-ray magnification and varying degrees of pericardial and epicardial fat accumulation the shadow should be no more than 5 mm.

In the presence of pericardial effusion the heart assumes a dependent position (4) and the fluid, if freely mobile and in sufficient quantity, widens the space be-

<sup>1</sup> From the Department of Radiology, Yale-New Haven Medical Center, New Haven, Conn. Presented at the Forty-fourth Annual Meeting of the Radiological Society of North America, Chicago, Ill., Nov. 16-21, 1958.

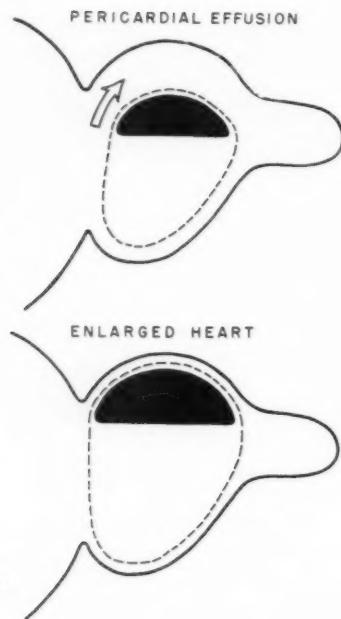


Fig. 1. Diagram of heart of patient in left decubitus position. Lower figure illustrates findings in an enlarged heart without pericardial effusion. The non-hypertrophied right atrial wall, pericardial and pleural coverings produce a thin opaque band between the intracardiac gas bubble (in black) and overlying lung. Upper figure shows how the opaque band (arrow) is widened as the heart assumes a dependent position and pericardial fluid moves between the right atrial wall and pericardial lining.

tween the pericardium and atrium (Fig. 1). The opaque band will then be of increased width. A similar widening, but usually of less degree, may be seen in pericardial thickening. In the large dilated heart the right atrial wall remains of normal size or its thickness is only slightly increased. It is possible in most instances, therefore, to differentiate between cardiac enlargement and significant pericardial effusion.

#### TECHNIC

Several methods of filming were used in the present series. Most of the patients were studied with the Fairchild cassette. Three were examined satisfactorily by cineradiography. Recently the technic recommended by Stauffer, with one or two  $14 \times 17$ -inch films taken immediately after the gas injection, has been successful.

When serial filming apparatus is employed, a fluoroscopic examination is first made in the left decubitus position. The right atrium is marked off on the back and anterior chest. The patient is then placed in front of the cassette and the central ray is directed through the chest at the atrial level. All films are made postero-anteriorly at 36 inches distance (Fig. 2).

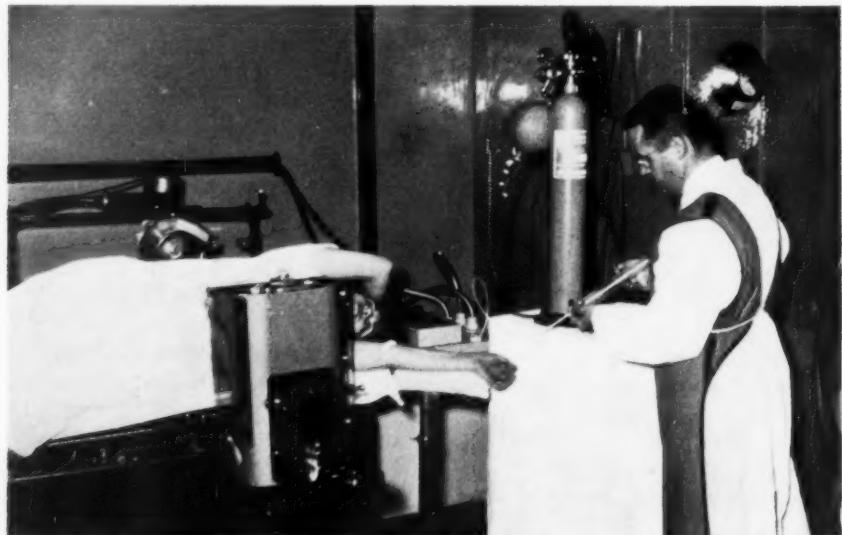


Fig. 2. Position of the patient, serial filming device, and carbon dioxide tank during examination.

(Fig. 1) of the patient, but the diaphragm remains in the same position only in the most be-cant used elements of the machine. Two closely spaced first The and second central ro- (2). A tank of 100 per cent carbon dioxide is attached to a 50-c.c. syringe through a 3-way stopcock (Fig. 3). An anesthesia bag and tubing serve to connect the tank and syringe. The tubing is wired snugly at all points of attachment to prevent possible air contamination. Following this, a 2-foot plastic sterile tube is added to the stopcock. The entire system is then flushed ten to fifteen times with carbon dioxide. An 18-gauge needle is placed in the left antecubital vein. The tubing is flushed again several times and then connected rapidly to the needle. A 50-c.c. injection of gas is made over a two- to three-second interval. Filming at a rate of one film per second is started at the beginning of the injection and continued for a period of fifteen to twenty seconds. During this time the patient has been instructed to use quiet, shallow respiration. At the conclusion of the examination he is kept in left decubitus position until fluoroscopy or a check film taken five minutes later shows absence of the gas bubble.

When the 5-inch Philips image amplifier is used, the patient is placed on a

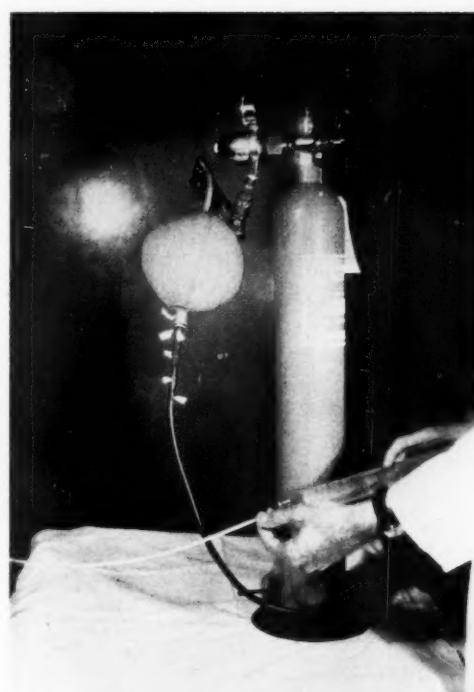


Fig. 3. Close-up of 100 per cent carbon-dioxide tank, tubing, and three-way stopcock. The rubber bag acts as a reservoir for the CO<sub>2</sub> prior to examination. White tabs are around wires used to hold rubber tubing snugly against glass fittings to prevent air contamination.



Fig. 4. Position of patient and image amplifier during examination.

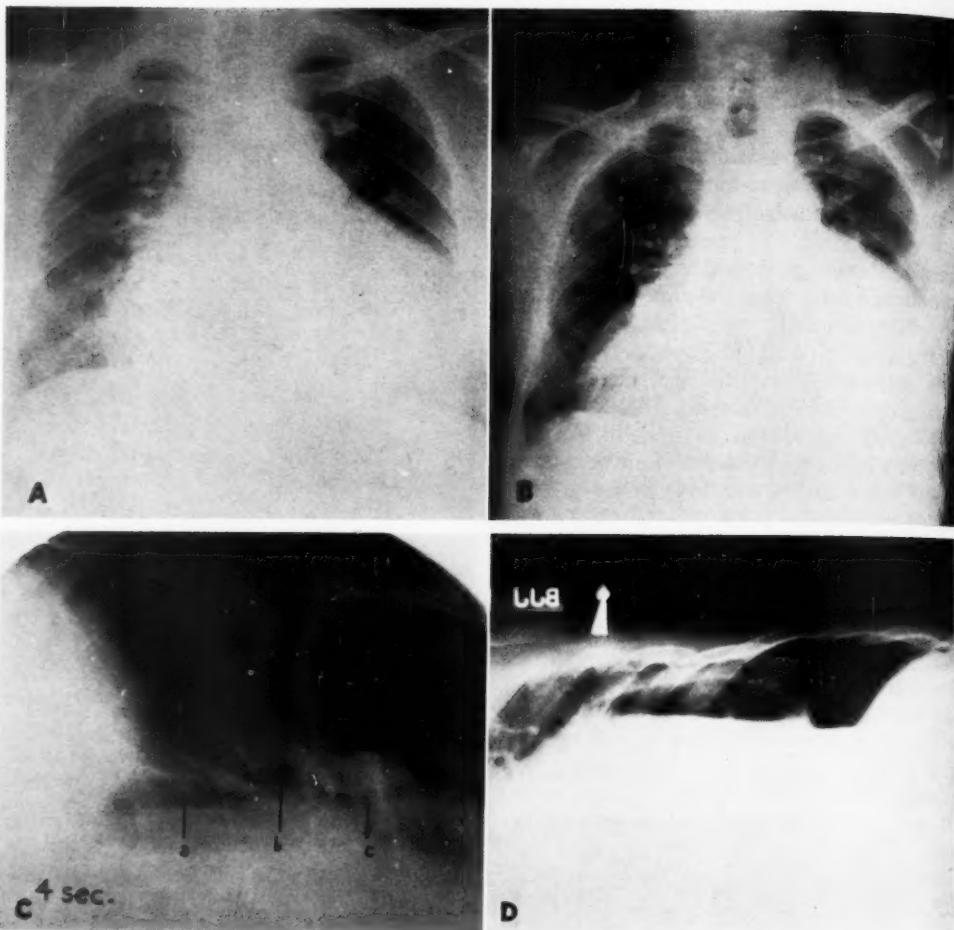


Fig. 5. Case I: J. C. A. Chest film in 1955, interpreted as showing probable cardiac enlargement. B. Cardiac silhouette in 1957 indicating pericardial effusion. C. Intracardiac gas four seconds after injection. Gas in inferior vena cava at 'a', superior vena cava at 'c'. Note marked increase in distance of right atrial gas bubble, 'b', from right lateral edge of cardiac silhouette, indicating very large pericardial effusion. D. Confirmation of pericardial effusion by instillation of air in pericardial sac. Note pneumothorax occurring at the time of the tap.

stretcher in front of the upright fluoroscopic table (Fig. 4). In order to bring the amplifier down to the level of the left atrium with ease, the chest is built up with pillows, and preliminary filming is done. The image of a metal marker of known size placed on the anterior chest over the heart is recorded on the film to correct for magnification. The fluoroscopic carriage is lifted while the needle is inserted and the tubing is connected. The amplifier is swung back into position

rapidly, and the injection is observed and filmed simultaneously.

#### RESULTS

The following cases serve to highlight the value and diagnostic acceptability of this technic. The patients were studied by fluoroscopy for cardiac pulsations and, initially in the series, kymography was carried out. The cardiac contours were evaluated in the erect and recumbent positions and confirmatory 14 X 17-inch

films cases  
associated  
clusively  
candi-

CASES  
been t  
ten-ye  
to be  
basis.  
sistent  
1957 t  
enlarg  
however

Fluid  
margin  
shadow  
bon-di  
right a  
jection  
cal ar  
placed  
tance  
lung p  
4.5 cm  
fusion

Sub  
fluid  
closed  
would  
postm  
of flu  
cardia  
ent.

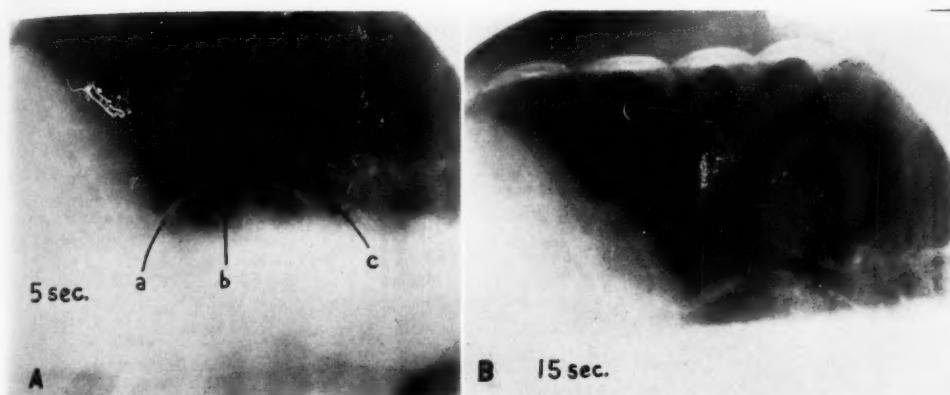


Fig. 6. Case II: M. W. A. Gas-blood level in right atrium *b*, at five seconds after injection. Thin opaque band at *a*, indicates only cardiac enlargement; *c* shows gas in right atrial appendage as indicated by trabecular pattern.

B. Gas bubble at fifteen seconds after injection, moderately diminished in size. Opaque band appears thicker due to different phase of respiration. The shadow of the inferior arc may at this time be made up in part by right ventricular wall.

films were taken. In the majority of the cases the resulting information and associated clinical data were thought inconclusive and the patients then became candidates for carbon-dioxide examination.

CASE I (Fig. 5): J. C., a 67-year-old male, had been treated for recurrent congestive failure over a ten-year period. His cardiac disease was thought to be primarily on a hypertensive arteriosclerotic basis. In 1955 a chest film was interpreted as consistent with generalized cardiac enlargement. In 1957 the cardiac silhouette showed further overall enlargement. The sagging lower angles of the heart, however, suggested pericardial effusion.

Fluoroscopy showed feeble pulsations of all cardiac margins and there was greater fullness of the cardiac shadow when the patient was prone. The first carbon-dioxide injection outlined the superior and inferior vena cava, but a definite gas-blood level in the right atrium could not be ascertained. A second injection, of 100 c.c. of gas, showed a small hemispherical area of radiolucency which appeared centrally placed inside the right cardiac outline. The distance between the cardiac gas shadow and overlying lung parenchyma was markedly increased, measuring 4.5 cm., indicating the presence of a very large effusion.

Subsequent pericardial tap yielded only 160 c.c. of fluid. Instillation of air at that time, however, disclosed considerable residual effusion. The patient would not submit to further pericardiocentesis and at postmortem examination, two months later, 3 liters of fluid were found in the pericardial sac. Moderate cardiac hypertrophy and dilatation were also present. The right atrial wall was of normal thickness.

CASE II: M. W., a 29-year-old Negro female, had been well until five months following a full-term twin pregnancy. Progressive congestive heart failure and cardiac enlargement then became apparent on serial roentgen studies. The blood pressure was slightly elevated, the highest reading being 135/95 mm. Hg. The range in the third trimester of her pregnancy had been 110-125/60-80 mm. Hg. There was no antecedent history of rheumatic or hypertensive heart disease and no murmurs could be heard. A prenatal roentgenogram had shown a normal cardiac outline. Fluoroscopy now revealed generalized enlargement of the heart in a somewhat globular fashion. No alteration in the cardiac outline could be demonstrated with change from the erect to supine position. Kymography showed a decrease in the amplitude of pulsations along the heart margins, as well as blunting of the waves. In view of the cardiac enlargement since the prenatal film and the equivocal rise in blood pressure, the presence of pericardial fluid was considered. Sixty cubic centimeters of carbon dioxide filled the right atrium satisfactorily and a right atrial band of normal gauge was seen (Fig. 6). An opaque hemispherical density appearing through the gas shadow was thought to represent the blood-filled left atrium. Gas also outlined the trabeculated right atrial appendage. With the absence of demonstrable pericardial fluid, the roentgen diagnosis of generalized cardiomegaly was made. The clinical diagnosis at present is probable myocarditis of undetermined etiology.

It would appear then, as seen in the cases cited, that the differentiation of a normal atrial band and generous effusion is not difficult. There is a zone, however,

roughly between 5 and 20 mm., which may represent pericardial effusion, pericarditis, or both. There are several features in the films, however, which may help differentiate these entities, as illustrated in the following cases.

**CASE III:** E. C., a 40-year-old Negro, had been seen in 1956 with complaints of chest pain, night sweats, and weight loss. These symptoms and the

heart with change from the supine to the erect position. Carbon-dioxide studies showed an opaque band measuring 6 mm. at the summit and 17 mm. at its inferior arc. In this instance the gas bubble (Fig. 7) occupies an eccentric position in relation to the larger opaque shadow. This is caused by pericardial fluid widening the space between heart and diaphragm but not present in sufficient quantity to cover the top of the atrium. Pericardiocentesis produced 400 c.c. of bloody fluid. Smear and culture of this fluid were again negative for acid-fast

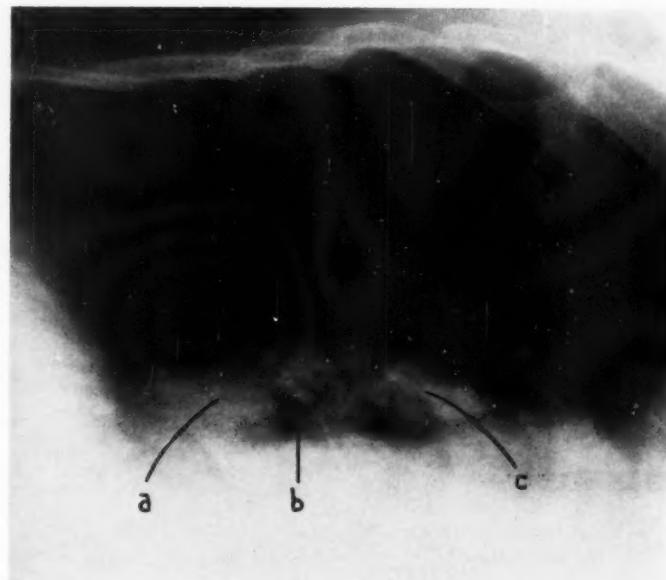


Fig. 7. Case III: E. C. Right atrial gas shown at *b*. Note disparity of size of inferior arc of opaque band at *a* and superior arc at *c*, indicating pericardial effusion.

associated history of close contact with an active tuberculous patient initiated a tuberculosis work-up. The P.P.D. reaction was positive. The chest films showed only a primary calcified granulomatous complex. Sputum cultures, as well as guinea-pig inoculation, were negative.

The patient was admitted to the hospital later in the year for multiple fractures of the extremities. He ran a persistent low-grade temperature, and re-filming of the chest showed an increase in the size of the cardiac silhouette. This was interpreted as consistent with either pericardial effusion or generalized cardiac enlargement. A pericardial biopsy was performed and 10 c.c. of serous fluid was evacuated at the same time. The fluid was negative on culture, and microscopic sections of the pericardium were normal.

In the course of several weeks the cardiac shadow continued to enlarge. Fluoroscopy showed normal pulsations, preservation of the normal general cardiac outline, and no alteration in configuration of the

organisms. The patient, however, responded dramatically to para-aminosalicylic acid and isoniazid with a rapid drop in temperature. In one month the cardiac silhouette had returned to normal.

**CASE IV:** O. F., a 29-year-old Negro female, was admitted to Grace-New Haven Community Hospital in August 1957 with a three-month history of cough, recent chills, and fever, and two months of gradually increasing dysphagia. A pericardial friction rub was heard. Chest films showed an enlarged globular cardiac silhouette and left pleural effusion. Fluoroscopy demonstrated decreased pulsation along both heart borders. Carbon-dioxide examination revealed an atrial band of uniform thickness measuring 1.5 cm. (Fig. 8). This finding and the unchanging configuration of the band on serial films suggested solely pericardial thickening. Pericardial tap produced only 5 c.c. of sanguineous fluid. Subsequently a broncho-esophageal fistula developed. Sputum culture indicated the presence of acid-fast

Fig. 4  
b four  
size, as  
ing. G

organis  
dial bi  
carditi  
pericar  
on a s  
sumed  
therap  
month

CAS  
mitted  
June 1  
anteri  
charact  
chest,  
ders a  
symp  
geno  
of no  
revea  
fricti  
limits  
chang  
cent  
Chest  
heart  
doxic  
2.5 c  
(Fig.  
cardi  
sion a  
howe  
of sev

The  
hospi

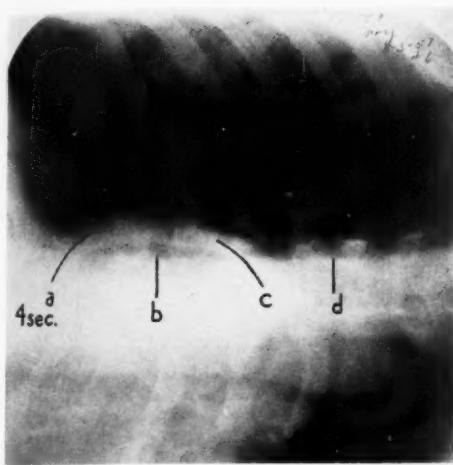


Fig. 8. Case IV: O. F. Right atrial gas bubble at four seconds after injection. Opaque band of equal size, as shown at *a* and *c*, indicates pericardial thickening. Gas in superior vena cava at *d*.

organisms. At the time of fistula repair a pericardial biopsy showed granulomatous and fibrinous pericarditis. No evident effusion was present in the pericardial sac. Although no organisms were seen on a smear, the changes in the pericardium were assumed to be on a tuberculous basis. Antituberculous therapy was instituted, and in the succeeding six months the heart size returned to normal.

CASE V: R. G., a 54-year-old white male, was admitted to the West Haven Veterans Hospital in June 1958 with a two-week history of intermittent anterior chest pain. This had been of acute onset, characterized by a crushing feeling in the anterior chest, accompanied by pain radiating to the shoulders and jaws. The patient had experienced no prior symptomatology referable to the chest. A roentgenogram obtained two years earlier showed a heart of normal size. Physical examination on admission revealed decreased heart sounds and a pericardial friction rub. The blood pressure was within normal limits. An electrocardiogram showed ST-T wave changes compatible with pericarditis, although a recent coronary infarction could not be excluded. Chest films demonstrated a marked increase in heart size, suggesting pericardial effusion. Carbon-dioxide injection studies outlined an atrial band of 2.5 cm. Although the band was of uniform width (Fig. 9), it was felt to be excessively wide for pericarditis alone, and the diagnosis of pericardial effusion and pericarditis was made. Pericardial tap, however, revealed no significant fluid. In the course of several weeks roentgen studies showed marked reduction in heart size.

Three months later the patient returned to the hospital in acute congestive failure which did not respond to therapy. Autopsy showed evidence of old

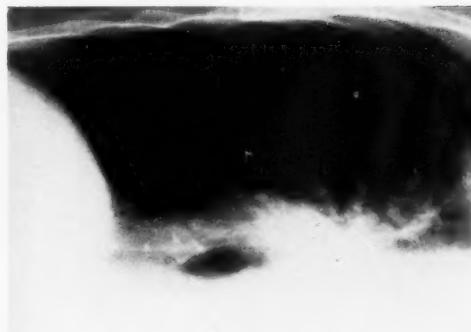


Fig. 9. Case V: R. G. Opaque band of uniform size but more than 2 cm. thick. Subsequent evidence obtained of pericarditis and probable effusion.

and acute myocardial infarction in the posterior wall of the left ventricle. The pericardium in the region of the right atrium was markedly thickened, there being no cleavage plane between pericardium and myocardium. These layers, as would be seen roentgenographically in the carbon-dioxide examination, measured approximately 1 cm. The discrepancy between autopsy measurements and the findings on carbon-dioxide injection, therefore, suggested that effusion as well as pericarditis had been present at the time of the earlier carbon-dioxide study.

Close analysis of the opaque band as seen in these 3 cases can help establish the presence of pericardial fluid or thickening. Asymmetry of the opaque band, found in Case III, as a clue to effusion has been described by Durant and his associates (4), who also reported a case similar to our Case IV. In their study the diagnosis of pericarditis was made on the basis of constant uniform thickness of the opaque band and flattening of the dome of the gas bubble by the relatively inelastic pericardium. When the opaque band exceeds approximately 2 cm., these differentiating signs would appear to lose their usefulness, as in our Case V, and the degree of fluid and/or thickening cannot be evaluated. It would seem unlikely, however, that a band exceeding 2 cm. would be produced by acute or chronic pericarditis alone. Further support for this view comes from the work of Figley and Bagshaw (6). These authors measured the same components of the atrial band

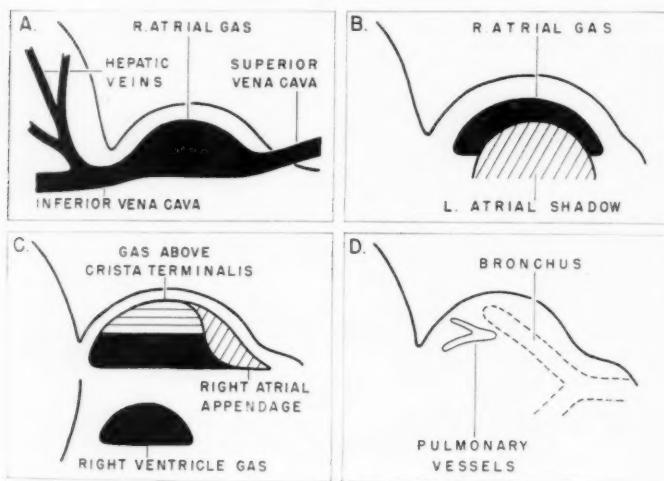


Fig. 10. Salient features of film interpretation.

- A. Reflux of gas into hepatic veins and inferior vena cava.
- B. Appearance of opaque left atrium in right atrial gas shadow.
- C. Compartmentalization of gas shadow in right atrium and gas under tricuspid valve in right ventricle.
- D. Spurious gas shadows produced by intermediate bronchus and pulmonary vessels.

as seen in opaque angiograms and listed values of 4.5-8.5 mm. for constrictive pericarditis. As seen in Table I the values

TABLE I: ATRIAL BAND MEASUREMENTS

	Angio- cardiography*	CO <sub>2</sub>
Normal	4 mm.	5 mm.
In pericardial effusion	10-15 mm.	12-45 mm.

\* From Figley and Bagshaw (6).

for pericardial effusion in Figley's series exceed 10 mm., as in the carbon-dioxide series. The greater average measurement in the carbon-dioxide studies is due in part to case variation. Also, the opaque-angiography measurements were made in the supine position. The carbon-dioxide technic, employing the decubitus position, allows greater fluid accumulation between the right atrium and pericardium.

Several other interesting facets of film interpretation are compiled in Figure 10. Gas in several cases has refluxed into the hepatic veins. At times the blood-filled left atrium may be seen as an opaque density in the gas shadow. The gas bubble may appear compartmentalized. In this instance there appears to be a

radiolucency within an area of greater radiolucency, the two being sharply demarcated by a linear shadow running parallel to the gas-blood level. The upper radiolucency can be explained on the basis of gas collecting in a smaller volume of atrium above the crista terminalis. In several cases the heavily trabeculated atrial appendage has been outlined. Frequently a gas bubble under a tricuspid valve in the right ventricle was noted. Occasionally the superimposed intermediate bronchus or ramifying pulmonary vessels may mimic a small gas bubble and make evaluation difficult unless this shadow has been recognized on a preliminary film.

It must be remembered that occasionally the cardiac silhouette may be altered by invasive pericardial disease such as metastases, multiple myeloma, sarcoidosis, or amyloid infiltration. If these entities or benign or malignant tumors are present in the region of the right atrial wall, the gas bubble is displaced and a false positive finding of fluid is obtained. Lesions within the right atrium such as tumor or thrombus will also produce an abnormal outline in the opaque band. In one case of the series the superior arc of the band

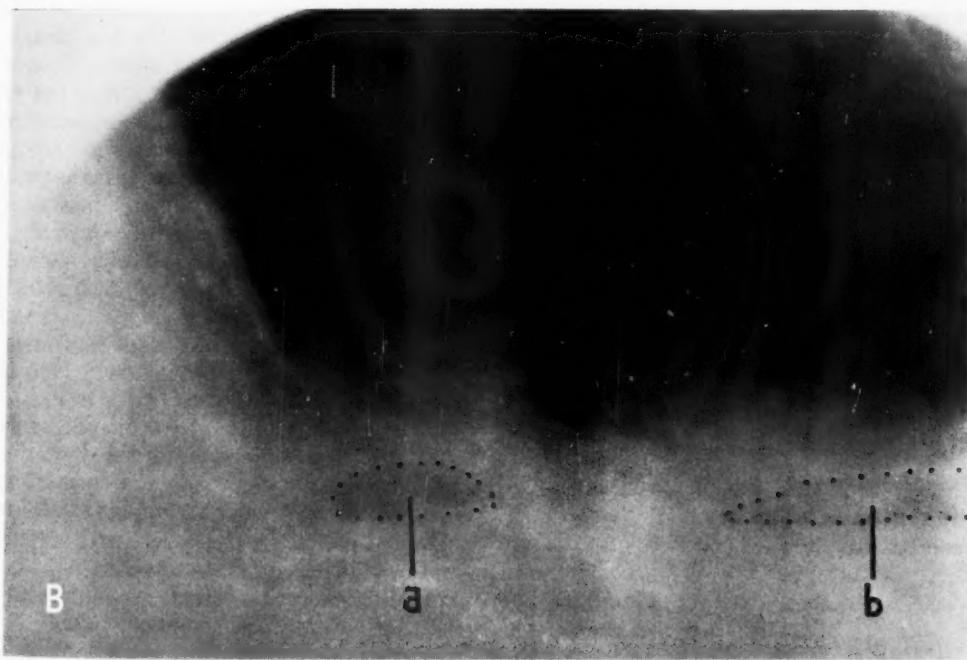
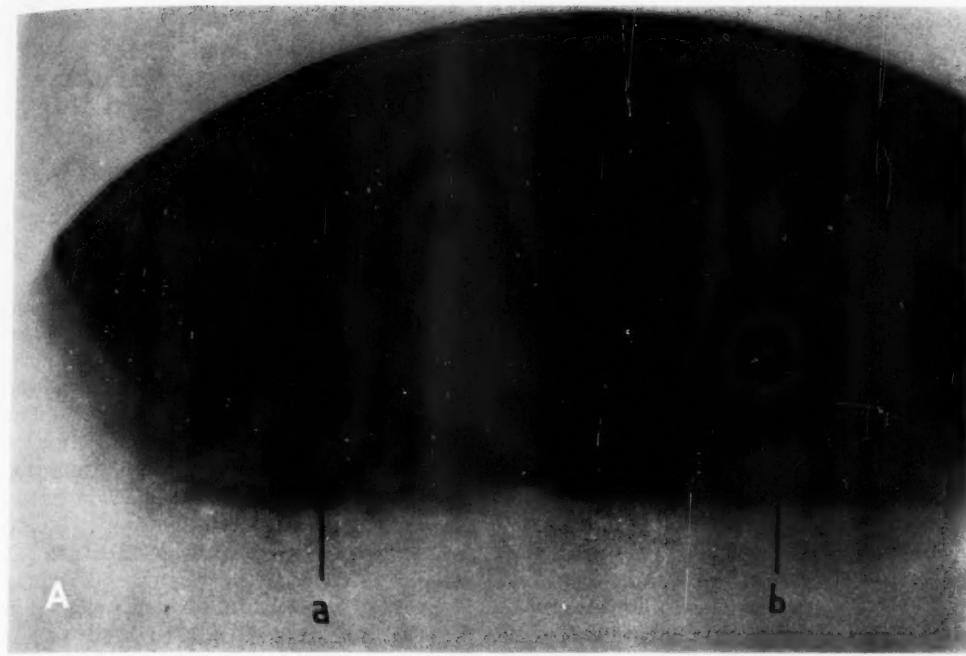


Fig. 11. Effect of diaphragm position on residual right pleural fluid.

A. During inspiration a normal opaque band over the right atrial gas bubble is seen at *a*; gas in superior vena cava at *b*.

B. In expiration right pleural fluid moves over gas in right atrium *a*; and gas in superior vena cava *b*.

was of abnormal caliber, the summit and inferior arc being of normal size. At postmortem examination, a thrombus was found filling the right atrial appendage, thus explaining the disparity of the arc measurements. When abnormalities of this sort are suspected, either from clinical data or a bizarre cardiac silhouette, opaque-contrast studies may be suggested. When these are feasible, opacification of all the cardiac chambers will give more information regarding the extent of the lesion than the localized carbon-dioxide study.

A final point in film interpretation to be stressed is that pulmonary infiltration in the vicinity of the right atrium or mobile right pleural fluid will obviate accurate assessment of the opaque band. An example of the latter is shown in Figure 11. This patient had both enlargement of the cardiac silhouette and right pleural effusion. Thoracentesis of the right chest prior to carbon-dioxide studies left only moderate blunting of the right costophrenic angle. It was evident, however, that fluid had shifted into the right mediastinal space at the time of the carbon-dioxide examination. Figure 11, A shows a normal atrial band during inspiration. In expiration (Figure 11, B), pleural fluid produces a false positive opaque band over the atrial gas bubble. The separation of the gas bubble in the superior vena cava from the lung indicates further that the fluid is in the pleural space rather than in the pericardial sac.

#### PATIENT SAFETY

Patient safety was of foremost concern in the use of this method. The experimental animal work of Oppenheimer and later reports in the German literature (7, 8) indicated that small quantities of carbon dioxide in the heart were well tolerated. Further reassurance was gained from the studies of Harvard and White (9) at this institution (Yale University). These investigators showed the diagnostic value and safety of carbon dioxide in the retroperitoneal space by injecting carbon

dioxide intravenously in dogs, at the rate of 100 c.c. per minute to a total of 10,000 c.c. with no demonstrable effects. This rate of administration of gas is, of course, slower than in the human studies. It does indicate, however, that sustained delivery of small amounts of free gas are well tolerated.

A major problem arose early in the case series concerning the degree and danger of diffusion of oxygen and nitrogen into the carbon-dioxide bubble once the bubble was inside the atrium. Because of this possible contamination, it was decided initially to turn the patient into the supine position at the conclusion of the examination, usually twenty to thirty seconds after the injection. It was felt that in this way the remaining free  $\text{CO}_2$  would be dispersed in the capillary bed of the lungs. One of 15 patients manipulated in this fashion was the only one in the entire series in whom any complications in the use of the carbon dioxide technic were manifested. In this case an episode of paroxysmal coughing lasting for thirty minutes developed immediately after the patient had been turned on his back. It was unaccompanied by dyspnea, hemoptysis, or chest pain. Chest films taken immediately and over a period of several days showed no evidence of pulmonary infarction. This patient had been admitted for signs of right heart failure and persistent upper respiratory infection. It is known that when patients with chronic lung disease breathe increased amounts of carbon dioxide, severe coughing may result, presumably due to the irritative effect of the weak carbonic acid formed on the diseased bronchial mucosa. It is highly probable in the case cited that the carbon-dioxide bubble, when it reached the pulmonary circulation, was not evenly distributed in the capillary bed. An increased amount of carbon dioxide diffusing into a localized area of lung with pooled secretions could adequately explain this patient's symptoms.

After this experience, the rate of reduction of the gas bubble in the atrium

was reviewed and found to be relatively slow in some instances. In Case II, for example, the gas bubble was only moderately diminished in size after fifteen seconds (Fig. 6). This was found to be true in varying degrees in 9 of 16 cases; in 1 case the bubble was reduced by only one-fifth of its maximum size twenty-eight seconds after the injection.

The recognition of the persistence of the carbon-dioxide bubble, and Oppenheimer's (2) report of values of 10 to 20 per cent oxygen replacement of the bubble in the left heart one minute after injection, prompted analysis of the gas bubble in the right atrium of laboratory animals. Two dogs of moderate weight were anesthetized with Nembutal and placed in the left decubitus position. A cardiac catheter attached to a saline drip was placed in the right atrium. The position of the catheter and delivery of 100 per cent carbon dioxide into the atrium by this means was observed and filmed with cineradiographic technics. Unfortunately, in both dogs a 50-c.c. gas bubble went into solution so rapidly that an adequate gas sample could not be withdrawn. For this purpose 200 c.c. of gas was required. Samples were withdrawn at forty-five seconds when the bubble had been reduced to approximately one-half its initial size. Further rapid solution of the bubble permitted only one sampling. The samples were collected with a mercury tonometer and analyzed with a Scholander apparatus. In those regarded as being collected without significant contamination, considerable variation in nitrogen content was found between two bubbles placed in the same dog and between the 2 dogs. There were 23 and 44 per cent nitrogen in the first animal and 14 per cent in the second. It is possible, in view of this variation, that contamination occurred during sampling. However, in each instance the oxygen content of the bubble was approximately 1 per cent and the carbon dioxide content varied indirectly with the nitrogen, ranging from 84 per cent to 55 per cent. It is

probable that variations in the blood-gas surface relationship from bubble to bubble and uneven mixing of the diffusing nitrogen in a short period could account for these differences. The important fact does appear that significant amounts of nitrogen can diffuse into the carbon-dioxide bubble rapidly.

The femoral artery pressure tracings were also of interest. With the large amounts of gas used (150-250 c.c.) the pulse pressure was reduced by one-third of its pre-injection value. This occurred on the average of one and one-half minutes after delivery of the gas. Return to normal pulse pressure took place rapidly, approximately two minutes after injection. A return to the pre-injection femoral artery pressure, however, required three and a half to four minutes. When the dogs were in the supine position, 100 c.c. of gas placed in the pulmonary artery per catheter reduced the diastolic femoral artery pressure by one-half and the pulse pressure became zero in one minute. A restoration to the pre-injection pressure occurred in three to four minutes. When 50 c.c. of carbon dioxide was used, a similar lowering of the arterial pressure was found, but to a less degree and over a shorter period of time. Electrocardiographic tracings taken during this time showed no irregularities.

These results would seem to indicate the possibility of embolism or hypotensive effects developing when the patient is turned on his back. Consequently our patients are now maintained in the left decubitus position after injection. As Durant and Stauffer (4) have emphasized, this position serves as a natural gas trap, preventing access of gas to the outflow tract of the right ventricle. At present a film is taken or fluoroscopy is performed five minutes after injection to check for residual gas. In the last 7 patients in this series no gas has been observed after this time and no complications have been experienced following the procedure.

In order to exclude significant contamination of the carbon dioxide employed,

a survey of our commercial hospital tanks was carried out. In each instance the degree of recorded contamination was within the limits of statistical error or insignificant. The survey showed:

Tank in use three months.....	99 per cent CO <sub>2</sub>
Fresh tank.....	97 per cent CO <sub>2</sub>
Tank in use three months, tubing, and 50-c.c. syringe.....	98 per cent CO <sub>2</sub>

Possibly the only contraindication to CO<sub>2</sub> examination is the presence of a known large intracardiac shunt. If, however, the patient is maintained in left decubitus throughout the period of gas reabsorption by the right atrial blood, it is highly improbable that the small quantity of gas administered could be directed through a septal shunt. Also, as indicated by the experimental work in animals by Oppenheimer (2), small amounts of carbon dioxide in the left heart are apparently innocuous.

A further limitation of the technic is, of course, the necessity of placing the patient in the left decubitus position and maintaining that posture for at least ten minutes. The patient in severe congestive failure or advanced pulmonary disease may be unable to co-operate satisfactorily for adequate filming. In 2 patients in this series, however, moderate and extensive pulmonary fibrosis and emphysema were present and the examination was well tolerated. If chronic lung disease or congestive failure is found, a preliminary trial in the left decubitus position may be made to check for development of unusual pulmonary complaints. If these do occur during an examination they may be attributed to the patient's posture rather than to the effects of carbon dioxide.

Finally, in the evaluation of patient safety it may be asked if this method has any advantage over opaque contrast materials. Steinberg (10) has shown early development of pericardial effusion by opacification of all chambers of the heart. Conceivably, smaller amounts of opaque material can be used to visualize the right heart. Both these technics, however, carry with them the risk of allergic reaction

or sensitization. Ultimately the use of a non-allergic opaque agent and biplane angiography would be the procedure of choice. Until that time, the carbon-dioxide method has given every indication of being a simple, effective, and safe tool in the differentiation of pericardial effusion and cardiac enlargement.

#### SUMMARY

A series of 22 patients were examined by the intravenous carbon-dioxide insufflation technic in order to differentiate pericardial effusion and cardiac enlargement. Correlation of the findings with the clinical course or subsequent autopsy findings of these patients would appear to bestow high diagnostic acceptability on the procedure.

The method can be used with rapid filming devices or the usual equipment of a general radiological department if several features of diagnosis described are kept in mind.

The examination can be performed easily and appears to be without hazard in the co-operative patient.

NOTE: The authors wish to express their gratitude to Doctors Frank D. Gray, Jr., and Albert S. Field, Jr., of the Cardiopulmonary Laboratory of Yale Medical Center for their valuable recommendations and analyses of gas samples.

Yale-New Haven Medical Center  
New Haven 4, Conn.

#### REFERENCES

1. HARE, H. A.: The Effect of the Entrance of Air into the Circulation. *Therapy Gazette* **13**: 606-610, Sept. 16, 1899.
2. OPPENHEIMER, M. J., DURANT, T. M., STAUFFER, H. M., STEWART, G. H., III, LYNCH, P. R., AND BARRERA, F.: In Vivo Visualization of Intracardiac Structures with Gaseous Carbon Dioxide: Cardiovascular-Respiratory Effects and Associated Changes in Blood Chemistry. *Am. J. Physiol.* **186**: 325-334, August 1956.
3. STAUFFER, H. M., DURANT, T. M., AND OPPENHEIMER, M. J.: Gas Embolism: Roentgenologic Considerations, Including the Experimental Use of Carbon Dioxide as an Intracardiac Contrast Material. *Radiology* **66**: 686-692, May 1956.
4. DURANT, T. M., STAUFFER, H. M., OPPENHEIMER, M. J., AND PAUL, R. E.: The Safety of Intravascular Carbon Dioxide and its Use for Roentgenologic Visualization of Intracardiac Structures. *Ann. Int. Med.* **47**: 191-201, August 1957.
5. PAUL, R. E., DURANT, T. M., OPPENHEIMER, M. J., AND STAUFFER, H. M.: Intravenous Carbon Di-

oxide for Intracardiac Gas Contrast in the Roentgen Diagnosis of Pericardial Effusion and Thickening. *Am. J. Roentgenol.* **78**: 224-225, August 1957.

6. FIGLEY, M. M., AND BAGSHAW, M. A.: Angiocardiographic Aspects of Constrictive Pericarditis. *Radiology* **69**: 46-53, July 1957.

7. GROSSE-BROCKHOFF, F., KOCH, D., LOOGEN, F., ROTHHOFF, G., VIETEN, H., AND WILLMANN, K. H.: Kohlendioxyd als Kontrastmittel für die Röntgendarstellung des Herzens und der Gefäße. *Fortschr. a. d. Geb. d. Röntgenstrahlen* **86**: 285-291, March 1957.

8. HÖFFKEN, W., JUNGHANS, R., AND ŽYLKA, W.: Die Grundlagen der Pneumoradiographie des rechten Herzens mit Kohlendioxyd. *Fortschr. a. d. Geb. d. Röntgenstrahlen* **80**: 292-301, March 1957.

9. HARVARD, B. M., WHITE, R. R., AND WALSH, J. F., III: Experimental Studies in Acute Retroperitoneal Carbon Dioxide Insufflation. *J. Urol.* **81**: 481-485, March 1959.

10. STEINBERG, I., VON GAL, H. V., AND FINBY, N.: Roentgen Diagnosis of Pericardial Effusion: New Angiocardiographic Observations. *Am. J. Roentgenol.* **79**: 321-332, February 1958.

#### SUMMARIO IN INTERLINGUA

#### Le Diagnose de Effusion Pericardial, Effectuate per Medio de Intracardiac Bioxydo de Carbon

Vinti-duo patientes esseva examineate per le technica de insufflation intravenose de bioxydo de carbon con le objectivo de differentiar inter effusion pericardial e allargamento cardiac. Si un paciente es positionate con le latere sinistre in basso e le latere dextere in alto, bioxydo de carbon que ha essite introducete per via intravenose ascende, post que illo ha attingite le atrio dextere, al superficie extreme de ille camera que alora es clarmente delineate. In iste position le atrio es visible como un umbra hemispheric attingente su culmine 4 a 5 cm supra le spina dorsal. Le banda opac inter le bulla de bioxydo de carbon e le suprajacente pulmon consiste de pleura, pericardio, e pariete atrial. Le largor de iste structuras in normal e allargate cordes amonta secundo constataciones necroptic a un valor medie de 3 mm. In le presentia de effusion pericardial, le corde se trova in position de-

pendente, e le liquido, si illo es liberemente mobile e presente in satis grande quantitates, allarga le spatio inter le pericardio e le atrio. Le banda opac ha alora un largor plus considerable. In le caso de un grande e dilatate corde, le pariete dextero-atrial remane normal in su dimensiones o es solo levemente accrescite in su spissitate. Assi il es possibile in le majoritate del casos differentiar inter allargamento cardiac e grados significative de effusion pericardial. Le correlation del resultatos de iste technica con le curso clinic o le subsecuente constataciones necroptic in le hic reportate casos supporta nostre fide in le accuratia diagnostic del procedimento.

Le methodo pote esser usate con dispositivos de radio-exposition rapide o le equipamento usual de un departamento de radiologia general. Le examine es facile a effectuar e pare esser sin risco in le caso de patientes qui es preste a cooperar.

#### DISCUSSION

**Dr. Herbert M. Stauffer** (Philadelphia, Penna.): It is naturally gratifying to find our idea for the carbon-dioxide visualization of the right atrial wall, developed originally from experimental studies, put to practical use by others.

I am sure that the intravenous injection of carbon dioxide is safe no matter what the position of the patient. The left lateral decubitus position, as employed by Dr. Seattliff, is actually the one indicated for prevention or treatment of air embolism.

Dr. Seattliff brought up the possibility of carbon dioxide entering the left side of the heart and the

arterial circulation through a septal defect. Our experimental studies with Dr. Oppenheimer are of interest in this connection, though not strictly comparable since the animals were anesthetized. Large volumes of carbon dioxide were injected into the distal segment of the cut carotid artery in dogs without observable ill effects. In other recent studies infarct-like lesions were produced chemically by selective injection into the coronary arteries of dogs (method of West); subsequent injection of carbon dioxide produced transient return of the electrocardiographic changes to normal.

## Radiographic Findings in Renal Vein Thrombosis<sup>1</sup>

NORMAN ZHEUTLIN, M.D., DIXON HUGHES, M.D., and BERNARD J. O'LOUGHLIN, M.D., Ph.D.

**I**N OUR CLINICAL experience we have encountered several instances of bizarre pyelographic patterns which have not been characteristic in their appearance and yet have the same pathologic etiology. When the various patterns were studied, it was determined that further investigation would be necessary to establish definitely the developmental processes involved. In all these cases occlusion of the renal vein was the common denominator.

In a review of the literature it was discovered that the roentgen aspect of renal vein occlusion has had little evaluation. The clinical syndrome and experimental details have been worked out and many case reports have been presented. Chronic renal vein thrombosis produces a nephrotic syndrome, which is the chief clue to diagnosis. Since definite changes can take place in the kidney and disturb the gross anatomy, roentgen findings should also be significant. With this in mind, we undertook a series of experiments to establish a roentgen-pathologic correlation.

The animal experiments consisted in the production of renal vein occlusion by surgical procedure and follow-up pyelography. In the first experiment an acute occlusion was produced by ligation of one renal vein. Catheters were placed in both ureters and retrograde pyelograms were obtained until the animal expired.

In order to simulate a chronic renal vein occlusion, a second experiment was carried out. A partial ligation of the renal vein was done, with a subsequent attempt to complete closure after three weeks.

In our third experiment a gradual closure of the vein was effected by a delayed action blood-vessel clamp made of steel, devised by Lowenfels *et al.* (15). The clamp is applied around a blood

vessel with the jaws held apart by a wrapping of absorbable surgical suture. As the suture is absorbed, the jaws of the clamp slowly occlude the vessel. This period of gradual closure serves to allow the development of collateral vessels and permits the organ to survive. The group of animals in the chronic experiment were submitted to periodic intravenous pyelography and evaluation.

Experimental ligation of the renal vein was first performed in 1843, by Robinson (21). Rowntree (22) in 1913 made an extensive study of the problem of using constrictive bands around the vessels, with ligatures. This resulted in albuminuria, hematuria, and the appearance of epithelial cells and casts in the urine. In 1921, Harrington (9) ligated the renal vein and made the following observations: (a) Symmetrical atrophy of the kidney occurred after complete sudden occlusion. (b) Partial venous collateral circulation to the kidney was established, chiefly by means of the ovarian or spermatic, suprarenal, and lumbar veins. (c) The collateral system was not capable of assuming the function of the renal vein. (d) Ligation of the renal vein in a dog may cause the kidney to rupture.

The electrolyte and water excretions and renal hemodynamics during congestion from caval obstruction were studied extensively by Farber and his associates (8). They noted a tendency of the blood pressure to fall slightly, and that the urinary excretion of electrolytes and  $H_2O$  was reduced.

The clinical syndrome of renal vein thrombosis occurs most frequently in children, over 50 per cent of the patients being less than five years of age. Ileocolitis is considered the chief predisposing cause in the young. In adults the condition may be secondary to thrombosis

<sup>1</sup> From the Department of Radiology, University of California at Los Angeles, School of Medicine. Presented at the Forty-fourth Annual Meeting of the Radiological Society of North America, Chicago, Ill., Nov. 16-21, 1958. Supported by funds from the Ventura County Heart Association.

of the inferior vena cava with extension into the renal veins. Malignant growths of the kidney produce occlusion by direct invasion or by extrinsic pressure. In some reported cases primary renal disease, such as amyloidosis, glomerulonephritis, and malignant hypertension, has produced thrombosis of the renal vein.

In reviewing the literature on thrombosis of the renal vein, we were particularly impressed by the few instances in which a definite diagnosis was made. Even more confusing are the various roentgen findings described. It was hoped that a definite set of roentgen findings might lead to the correct diagnosis. This did not seem to be the case.

One of the initial reports of this syndrome was accompanied by pyelograms suggestive of polycystic disease (Derow, 6). These showed elongation of the infundibula, with pressure defects on the calyces and pelves. The kidneys were enlarged and regular in contour and over a period of one year underwent a further increase in size. Postmortem examination revealed edema of the interstitial tissue of the kidneys, which was considered the mechanism for the pyelographic pattern. In this case there was chronic vein thrombosis of long duration.

Campbell and Matthews (5) were able to make an antemortem diagnosis from the x-ray appearance in one of their 2 cases. Retrograde pyelograms were obtained and in the first case showed a large kidney with blotting out of all pelvic markings. In the second case there was diffusion of the medium throughout the kidney, as if the "injection was made into a mass of mush." These cases were relatively acute in character.

Melick and Vitt (17) showed a retrograde pyelogram in which the pelvis was poorly visualized, irregular in outline, and irregularly filled. The kidney, following the occlusion of the renal vein, became quite swollen and edematous.

In 1945, Abeshouse (1) published an excellent article on thrombosis and thrombo-phlebitis of the renal vein. He reviewed

the literature back to Rayer, who reported the first example in 1837, and collected a total of 228 cases. He also noted that the majority of patients were children under five years of age. One case with an abnormal pyelogram showing a markedly irregular outline of the pelvis and upper ureter was presented. The appearance was suggestive of pyelitis cystica and ureteritis cystica. Actually the deformity was caused by edema of the mucosa secondary to thrombosis of the renal vein. In this collected series of 228 cases the diagnosis was made clinically in 3 instances. The x-ray diagnosis was based on size of kidney and retrograde pyelographic findings. The intravenous pyelogram was not considered helpful. In 9 of the reported cases retrograde studies were performed and in 2 the diagnosis was made, and made early. The changes were as described above, consisting of an irregular outline and incomplete filling of the pelvis. As the thrombosis progressed, the edema became more extensive and eventually occluded the pelvis, which failed to fill on pyelography. If contrast material was forcibly injected into the pelvis, filling of the veins and parenchyma resulted, producing a picture simulating a neoplasm or incomplete filling with pyelovenous backflow.

Regan and Crabtree (20) in their analysis of 94 cases of renal infarction found 71 instances of arterial infarct, 20 of venous infarct, and 3 of trauma. In 4 cases in this series retrograde pyelographic studies had been made, all showing some distortion.

Isolated case reports state that intravenous pyelography usually shows an absence of kidney function (Warren *et al.*, 25; Kaplan *et al.*, 13; Hasson *et al.*, 11). Others have reported normal intravenous pyelograms. Venography has been recommended as an aid to the diagnosis (10), the thrombosed vessel being visualized on an inferior vena cava study.

The varied findings described are not incompatible with the disease. It is possible to postulate different degrees of progression in vein thrombosis, producing



Fig. 1. Case I: Intravenous pyelogram showing an enlarged left kidney with distortion of the collecting system, simulating a "polycystic kidney." Renal vein thrombosis found at surgery.

gross changes in the kidney parenchyma. The x-ray image being a reflection of these pathologic phenomena, it is conceivable that a variable picture is produced. Thus, in acute thrombosis with massive infarction and perirenal hemorrhage, the intravenous pyelogram will show an enlarged nonfunctioning kidney. The retrograde pyelogram then shows the diffusion of contrast agent into the kidney mass with an amorphous distribution of density.

When one encounters a chronic, slowly progressive renal vein thrombosis, it is highly likely that adequate collateral circulation will take over the venous function, resulting in a relatively normal kidney. Between these two poles lie the changes produced by renal edema. Here one may see the "polycystic" deformity and the incomplete and irregular pelvis.

#### CASE REPORTS

**CASE I** (Fig. 1): E. G. O., a 60-year-old white female, gave a history of intermittent painless gross hematuria for three years. Prior to admission the patient began passing clots. Previous urological work-up was reported as negative. Physical examination revealed an enlarged left kidney. Urine showed a specific gravity of 1.020 with a trace of albumin and many red blood cells. Blood pressure was 168/50. A urogram was interpreted as showing a polycystic kidney. At surgery the enlarged kidney was found to have many tortuous venous plexuses over the surface. The renal vein was distended by a 3-cm. hemorrhagic yellow thrombus. The parenchyma showed adenocarcinoma. The kidney was removed and postoperative irradiation given. The patient is well at the time of this report.

**CASE II:** R. M., a 38-year-old white male, was admitted with a history of weight loss, fever, and



Fig. 2. Case III: Intravenous pyelogram showing enlarged kidneys with spreading of the collecting system due to renal edema secondary to renal vein thrombosis.

pain in the region of the right kidney. Physical examination revealed a palpable mass in the right flank. Blood pressure was 110/70. The specific gravity of the urine was 1.010, with 1+ albumin, casts, and white blood corpuscles. A nephrectomy was performed. Pathologic study showed a clear cell carcinoma of the kidney with complete occlusion of the renal vein.

**CASE III** (Fig. 2): A 52-year-old white male was troubled with severe epigastric pain. About six years previously he had experienced "tearing pain" in the back while lifting a stack of mattresses. Since then there had developed varicose veins of the legs and abdomen, stasis dermatitis of the legs, hematuria and albuminuria leading to a diagnosis of "nephritis," and jaundice. One episode of peritonitis had occurred. Five years after the original complaint, the patient suffered a moderately severe attack of melena, with a diagnosis of "duodenal ulcer." This siege of pain at the level of the diaphragm was the worst yet experienced by him and required opiates for its suppression. Ascites was minimal.

Laboratory studies showed an essentially normal hepatic function profile and slight S-T segment depression on the electrocardiogram. Roentgenography revealed a normal gallbladder, bilateral renal edema, a huge azygous vein, and inferior vena caval obstruction, with extensive paravertebral and abdominal collateral pathways.

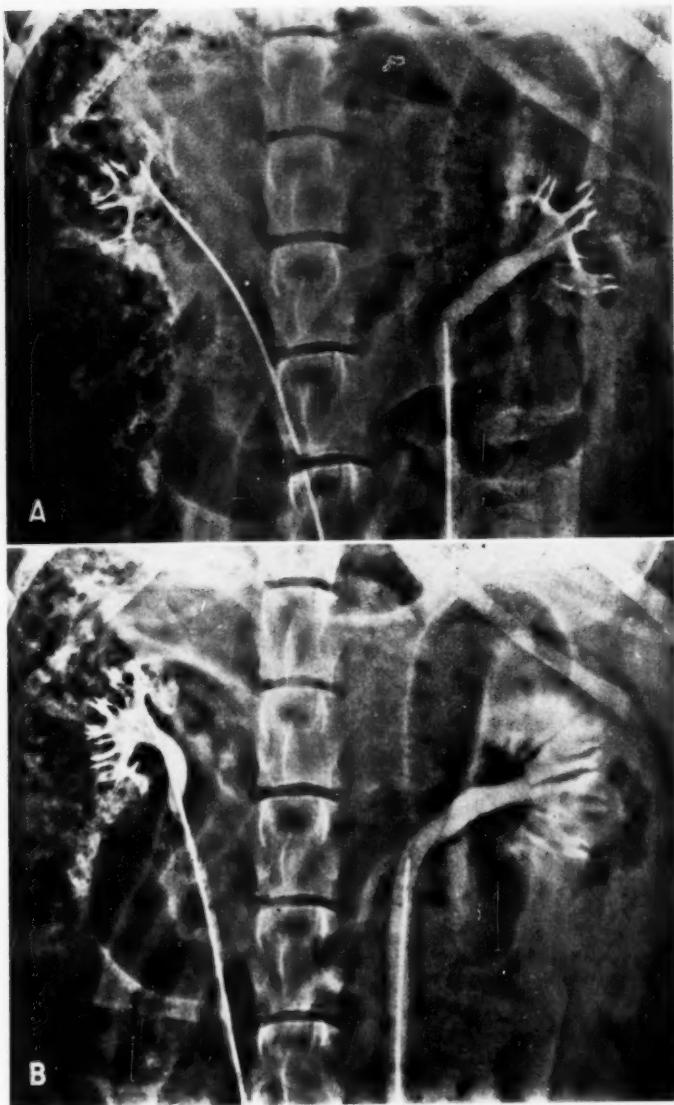


Fig. 3. Acute occlusion of left renal vein. A. Retrograde pyelogram made two hours following surgery, showing diffusion of contrast into parenchyma and dilatation of collecting system.

B. Film obtained five hours following surgery. More extensive changes demonstrated at this time.

#### SUMMARY OF EXPERIMENTAL DATA

An attempt was made to reproduce in dogs the changes observed clinically in renal vein thrombosis.

The first dog was operated upon after a routine intravenous pyelogram was obtained. The left kidney and both ureters

were exposed. Ureteral catheters were inserted from a point a few centimeters above the vesico-ureteral junction, and the renal vein was then ligated. The left kidney immediately became swollen and tense, and veins over the surface of the kidney and ureter became quite prominent. The ab-



Fig. 4. Left renal vein partially ligated ten days prior to intravenous pyelography. No change noted from examination made prior to surgery.

domen was closed, and the ureteral catheters were led out through the abdominal wound. Retrograde pyelograms (Fig. 3) made at hourly intervals showed increasing diffusion of the medium into the left kidney. Bloody urine was noted from the left ureteral catheter. The dog expired eight hours following the ligation. At autopsy the left kidney was found to be markedly edematous, with hemorrhage about the capsule of the kidney.

In the second dog a ligature was placed around the left renal vein so that approximately one-half of the lumen was obliterated. With the vein partially constricted, the abdomen was closed. Ten days later, an intravenous pyelogram (Fig. 4) revealed no change as compared to the preliminary pyelogram. Immediately after the second pyelogram was obtained, operation was again done, and an attempt made to occlude the renal vein completely. Unfortunately a great deal of difficulty was encountered, and the dog was sacrificed. The kidney and its vessels were examined. The renal vein proved to be patent, with a constriction at the site of previous partial ligation. Grossly there was no obvious difference in the appearance of the two kidneys.

In the third dog, a small steel spring clamp fashioned after the one described by

Lowenfels (15) was placed on the left renal vein and wrapped with plain 0 catgut to hold it open. Intravenous pyelograms were obtained at one- to two-week intervals. Although the clamp was seen to close slowly as time progressed, there were



Fig. 5. Chronic renal vein occlusion produced by metal clamp about the left renal vein. Film was made eight weeks after surgery. The kidneys appear unchanged.

actually no definitive changes in the appearance of either kidney. The kidneys were measured on the films by a planimeter, but no definite change in size could be detected. Since the clamp did not appear to be completely closed after eight weeks, surgery was again performed and the clamp was closed. In addition, another ligature was placed around the vein so as to insure its complete occlusion. Intravenous pyelography one week after the final closure still failed to reveal any significant change in the appearance of the kidney. Aortography showed no difference in the vascular pattern.

This third experiment was repeated with another dog and a similar clamp. Once again the pyelograms were normal in appearance, despite progressive closure of the renal vein over a six-week period.

#### SUMMARY

1. Renal vein occlusion was produced experimentally and the acute and chronic stages in the dog were studied roentgenologically.

2. Three cases of renal vein thrombosis in man are presented.

3. T  
basis m  
by the  
which  
cystic'  
4. T  
basis i  
Univers  
Los Ang  
1. T  
phlebiti  
661-675  
2. Nephro  
Februa  
3. FIELD,  
with T  
1211, D  
4. AND W  
Pressure  
April 1  
5. Renal  
Male  
Nephri  
604-61  
6. ITZ, H  
Vena  
Pictur  
Review  
April  
7. T  
tion C  
66: 33  
8. L. W.  
Hemo  
and I  
1145-  
9. of Va  
Arch.  
10. R. E  
Quart

3. The diagnosis of renal vein thrombosis may be suspected roentgenologically by the demonstration of an enlarged kidney which on pyelography presents a "pseudocystic" appearance.

4. The literature on renal vein thrombosis is reviewed.

University of California Medical Center  
Los Angeles 24, Calif.

#### REFERENCES

1. ABESHOUSE, B. S.: Thrombosis and Thrombo-phlebitis of the Renal Veins. *Urol. & Cutan. Rev.* **49**: 661-675, November 1945.
2. ALLEN, A. C.: Clinicopathologic Meaning of Nephrotic Syndrome. *Am. J. Med.* **18**: 277-314, February 1955.
3. BLAINEY, J. D., HARDWICKE, J., AND WHITFIELD, A. G. W.: The Nephrotic Syndrome Associated with Thrombosis of the Renal Veins. *Lancet* **2**: 1208-1211, Dec. 11, 1954.
4. BLAKE, W. D., WEGRIA, R., KEATING, R. P., AND WARD, H. P.: Effect of Increased Renal Venous Pressure on Renal Function. *Am. J. Physiol.* **157**: 1-13, April 1949.
5. CAMPBELL, M. F., AND MATTHEWS, W. F.: Renal Thrombosis in Infancy. Report of 2 Cases in Male Infants Urologically Examined and Cured by Nephrectomy at 13 and 33 Days of Age. *J. Pediat.* **20**: 604-615, May 1942.
6. DEROW, H. A., SCHLESINGER, M. J., AND SAVITZ, H. A.: Chronic Progressive Occlusion of Inferior Vena Cava and Renal and Portal Veins, with Clinical Picture of Nephrotic Syndrome; Report of Case, with Review of Literature. *Arch. Int. Med.* **63**: 626-647, April 1939.
7. CARVER, G. M., JR.: Traumatic Renal Infarction Concurrent with Massive Fat Embolism. *J. Urol.* **66**: 331-339, September 1951.
8. FARBER, S. J., BECKER, W. H., AND EICHNA, L. W.: Electrolyte and Water Excretions and Renal Hemodynamics During Induced Congestion of Superior and Inferior Vena Cava of Man. *J. Clin. Invest.* **32**: 1145-1162, November 1953.
9. HARRINGTON, S. W.: The Effect on the Kidney of Various Surgical Procedures on the Blood Supply. *Arch. Surg.* **2**: 547-592, 1921.
10. HARRISON, C. V., MILNE, M. D., AND STEINER, R. E.: Clinical Aspects of Renal Vein Thrombosis. *Quart. J. Med.* **25**: 285-298, July 1956.
11. HASSON, J., BERKMAN, J. I., PARKER, J. G., AND RIFKIN, H.: A Clinicopathologic Study of Chronic Renal Vein Thrombosis in Adults. *Ann. Int. Med.* **47**: 493-517, September 1957.
12. HWANG, W., ET AL.: Effects of Sustained Elevation of Renal Venous Pressure on Sodium Excretion in Unanesthetized Dog. *Am. J. Physiol.* **162**: 649-654, September 1950.
13. KAPLAN, B. M., ET AL.: Bilateral Renal Vein Thrombosis and the Nephrotic Syndrome. *Ann. Int. Med.* **45**: 505-518, September 1956.
14. KOERNICK, S. D., MOORE, J. R., AND WIGLESWORTH, F. W.: Thrombosis of Renal Veins with Massive Hemorrhagic Infarction of Kidneys in Childhood. Report of 4 Cases. *Am. J. Path.* **27**: 435-453, May-June 1951.
15. LOWENFELS, A. B., WADE, W. H., NEUMANN, C. G., AND LORD, J. W., JR.: Experimental Study of a Gradual Closing Delayed-Action Blood Vessel Clamp. *Arch. Surg.* **74**: 574-577, April 1957.
16. MCCLELLAND, C. Q., AND HUGHES, J. P.: Thrombosis of Renal Vein in Infants. *J. Pediat.* **36**: 214-227, February 1950.
17. MELICK, W. F., AND VITT, A. E.: Thrombosis of Renal Vein. *J. Urol.* **51**: 587-596, June 1944.
18. MILBURN, C. L., JR.: Hemorrhagic Infarction of Kidneys in Infants. Report of Unilateral Case in 8-Day-Old Male Infant With Survival of Infant Following Successful Nephrectomy. *J. Pediat.* **41**: 133-140, August 1952.
19. MILLER, G., HOYT, J. C., AND POLLOCK, B. E.: Bilateral Renal Vein Thrombosis and Nephrotic Syndrome Associated with Lesions of Polyarteritis Nodosa. *Am. J. Med.* **17**: 856-860, December 1954.
20. REGAN, F. C., AND CRABTREE, E. G.: Renal Infarction: A Clinical and Possible Surgical Entity. *J. Urol.* **59**: 981-1018, June 1948.
21. ROBINSON: *Med. Clin. Tr.* **26**: 51, 1843.
22. ROWNTREE, L. G., FITZ, R., AND GERAGHTY, J. T.: The Effects of Experimental Chronic Passive Congestion on Renal Function. *Arch. Int. Med.* **11**: 121, 1913.
23. SANDBLOM, P.: Renal Thrombosis with Infarction in Newborn. Two Different Forms. *Acta paediat.* **35**: 160-167, 1948.
24. SELKURT, E. E., HALL, P. W., AND SPENCER, M. P.: Response of Renal Blood Flow and Clearance to Graded Partial Obstruction of Renal Vein. *Am. J. Physiol.* **157**: 40-46, April 1949.
25. WARREN, H., BIRDSONG, M., AND KELLEY, R. A.: Renal Vein Thrombosis in Infants. *J.A.M.A.* **152**: 700-701, June 20, 1953.
26. ZUELZER, W. W., CHARLES, S., KURNETZ, R., NEWTON, W. A., JR., AND FALLON, R.: Circulatory Diseases of the Kidneys in Infancy and Childhood. *Am. J. Dis. Child.* **81**: 1-46, January 1951.

#### SUMARIO IN INTERLINGUA

#### Constatationes Radiographic in Thrombose de Vena Renal

Le autores ha incontrate plure casos de un bizarre configuration pyelographic, non characteristic in apparentia sed con le mesme etiologia pathologic: Occlusion del vena renal. Le variate constatationes non es incompatibile con le morbo: In acute thrombose con infarcimento massive e hemorrhagia perirenal, le allargate ren con absentia de function es vidite in pyelographia intravenose durante que le pyelogramma retrograde monstrava diffusion del

agente de contrasto a in le massa renal con distribution amorphe de densitate. In chronic e lentemente progressive thrombose venose, adequate circulation collateral accepta, con alte grados de probabilitate, le function renal, e isto resulta in un ren que es relativemente normal. Inter iste duo polos se rangia le alteraciones producute per edema renal. Hic on pote vider deformitate "polycystic" e un pelve incomplete e irregular.

Es summarisate quatro casos. Es reportate studios experimental. Effectos de ligation total del vena renal, de ligation partial, e de ligation a action retardate per medio de un crampa que se restringe lentemente super le vaso de sanguine

esseva studiate in canes. In le prime caso, le morte del animales eveniva in octo horas. Sub le condiciones del secunde e del tertie experimento, nulle significative alteration del apparentia del ren o de su configuration vascular esseva notate.



R  
by  
rel  
has  
To  
ma  
cal  
flu  
nos  
sur  
this  
tion  
break  
to c  
T  
nom  
1.  
ulat  
carc  
acco  
dist  
of th  
vasc  
2.  
noto  
ader  
3.  
in cl  
time  
"due  
a fe  
tion  
situ.

D  
from  
nati  
affor  
curac  
men  
234 v

<sup>1</sup> Fr  
Accep

## Roentgenography and Biopsy in Mammary Cancer<sup>1</sup>

SIMON M. BERGER, M.D., HELEN INGLEBY, M.D., and J. GERSHON-COHEN, M.D., D.Sc.

**R**OENTGENOGRAPHY OF the breast is a routine diagnostic measure accepted by only a few radiologists. One reason for reluctance to use this type of examination has been misunderstanding of the rationale. To bother with x-ray studies of the mammary gland, which is so accessible to physical examination and biopsy, seems superfluous. The low accuracy of roentgen diagnosis in earlier studies has also deterred surgeons and radiologists from adopting this procedure. The present communication will summarize our experience with breast roentgenography and its relationship to diagnostic surgical resection.

The cardinal roentgen criteria of carcinoma of the breast are:

1. The presence of an irregular or spiculated opacity, usually seen in scirrhouous carcinoma. Advanced neoplasms are also accompanied by such secondary changes as distortion of breast architecture, thickening of the skin, nipple retraction, and increased vascularity.

2. A rounded opacity with localized notching or infiltration as in medullary or adenopapillary types of carcinoma.

3. Needle-point calcifications arranged in clumps, sometimes linearly and at other times widely scattered, frequently noted in "duct" carcinoma. We have encountered a few examples of this type of calcification when the carcinoma still remained *in situ*.

### ACCURACY OF ROENTGENOGRAPHY OF THE BREAST

During the past two years, 536 patients from a total of 1,500 who had breast examinations underwent subsequent surgery, affording an opportunity to check the accuracy of the x-ray findings. Of 919 women reported to have benign breast lesions, 234 were operated upon, with confirmation

of the x-ray diagnosis in 229, or 98 per cent. Of 118 reported to have malignant mammary lesions, 108 were operated upon and 106 of these, or 98 per cent, proved to have cancer. In 173 women who had lesions reported as probably benign by the roentgenologist, 91 were operated upon and in 83, or 91 per cent, the condition was found actually to be benign. In another group of 122 women in whom the radiologist could make no definite diagnosis but suspected the possibility of cancer, 92 were operated upon and 48, or 52 per cent, were found to have malignant disease. Since this last figure is hardly better than guesswork, we have come to recognize that in about 10 per cent of all x-ray examinations the results are non-contributory and the radiologist is better advised so to state his findings. In other words, where the experienced radiologist can make a definite diagnosis of the lesion, whether it be benign or malignant, the percentage of accuracy is better than 95 per cent. For those lesions of which he is uncertain, but which he believes are probably benign, accuracy falls to 90 per cent; and finally, in about 10 per cent of all examinations, he is apt to find himself in a position where he cannot give a reliable opinion.

In another series of 209 consecutive cancers, 151 were diagnosed correctly by the surgeon, but the roentgenologist increased this number to 194. Thus the x-ray examination was responsible for a correct pre-operative diagnosis of 95 per cent instead of the 72 per cent of the surgeon. Even more important was the difference in the incidence of axillary lymph node metastasis in this supplementary group of cases diagnosed roentgenologically. Not only were smaller lesions discovered, but axillary lymph node metastases were present in only 13 per cent of this group in contrast to

<sup>1</sup> From the Department of Radiology, Albert Einstein Medical Center, Northern Division, Philadelphia, Penna. Accepted for publication in December 1958.

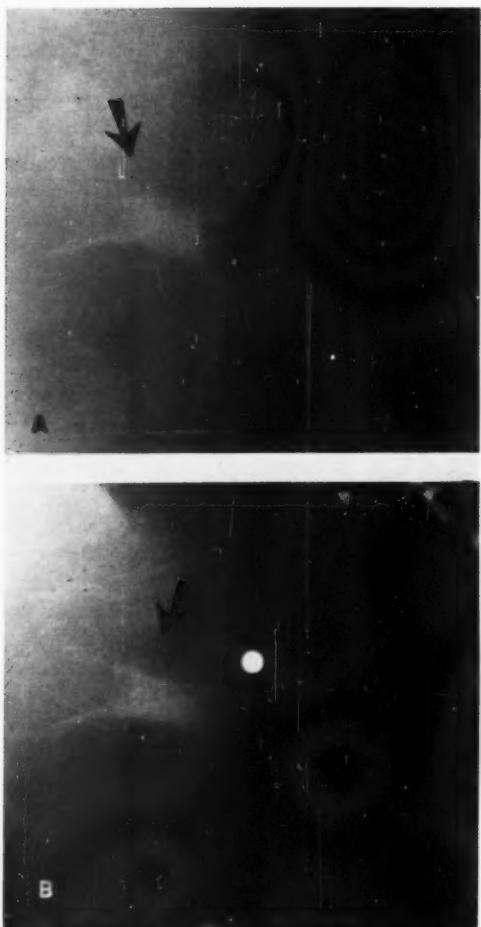


Fig. 1. Slow growth of a duct carcinoma in an asymptomatic survey patient aged 68 years. The irregular spiculated mass (A) was not appreciated by the radiologist. The patient returned for examination six months later and, though a mass was still not palpable, an x-ray diagnosis of "suspicious malignancy" was made. At the end of eighteen months and four subsequent examinations (B), though still no mass was palpable, a quadrant dissection revealed an intraductal carcinoma 1.5 cm.  $\times$  0.8 cm.

64 per cent of those cases detectable by the surgeon.

#### GROWTH RATE STUDIES

Over the past five years, 16 cases were seen in which two or more successive x-ray examinations of growing mammary cancers were available. In some of these the lesion had been missed at an earlier x-ray study, due either to poor technic or inexperience.

Six of these cases have been previously reported in detail (1). The volumes were calculated by a simple formula from tumor areas measured on the x-ray film. The following interesting correlations appear: (a) All tumors under study grew at one of two distinct rates. In one group, intraductal and medullary adenopapillary cancers grew on the average, approximately 5 per cent per month (Fig. 1). In the other group, scirrhous and lobular cancers grew considerably faster, averaging 20 per cent increase in volume per month (Fig. 2). (b) Exponential growth was observed consistently. It was seen in the largest lesions, over 2.5 cm. in diameter, as well as in the neoplasm of 0.5 cm. (c) Cases in which three or more observations were available did not deviate significantly from the expected growth path. The last two findings substantiate the recent observations of Collins, who used successive x-ray examinations for study of tumor growth (2). Of the 16 patients studied, only 7 had a palpable tumor by the time of operation and the others, except 1 who refused surgery, were operated upon because of positive x-ray findings in the absence of a palpable tumor. Cancers as small as 0.5 cm. in diameter were detected by the x-ray examination (Fig. 3).

The x-ray diagnosis of "suspicious malignancy" in the absence of a dominant lump has sometimes led us into difficulties with surgeons who have refused to operate. In one patient followed from Nov. 12, 1956, to Feb. 8, 1958 (Fig. 4), it was noted that slight but definite gradual increase in the degree of calcification was occurring. At biopsy a diagnosis of adenocarcinoma, mainly intraductal, with a small area of stromal invasion, was made. The surgeon felt nothing remarkable, by-passed a frozen section, and did a local excision. At the time of the radical mastectomy, the axilla was not involved.

It is most important to emphasize that a roentgen study of the breast is no substitute for histologic diagnosis. A definite dominant mass with clinical signs indicating a neoplasm calls for surgical action;

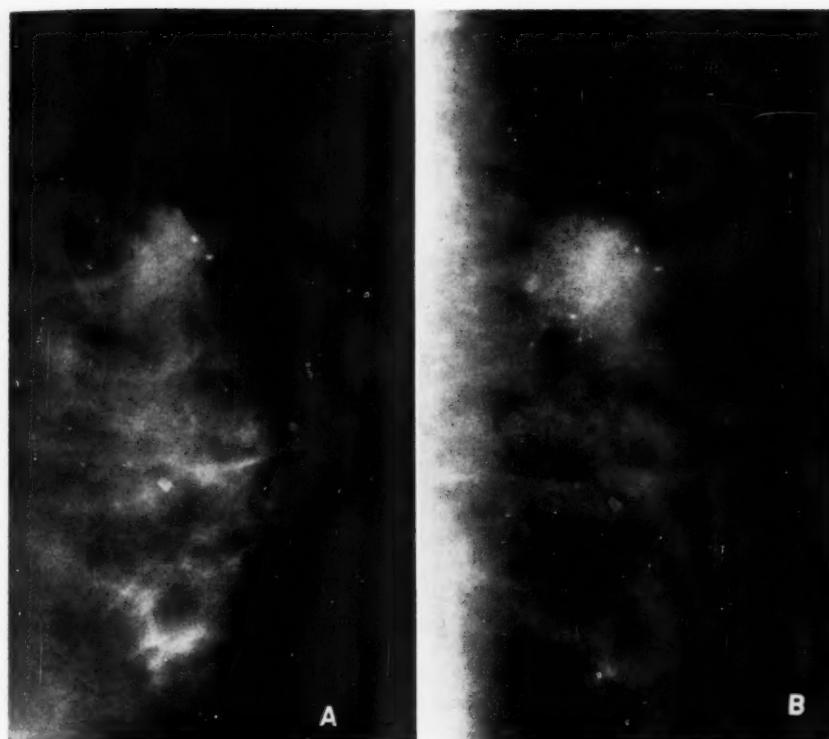


Fig. 2. Fast growth of a scirrhous carcinoma in a patient of 45 years. She was examined radiographically at time of admission for a nipple discharge from the right breast; no palpable lesion in either breast was detected by the surgeon or in the radiological department.

A. The opacity in the left breast was not appreciated roentgenographically. Six months later, the patient discovered a mass in the left breast. B. A second x-ray examination reveals considerable increase in size of tumor.

but omission of a preliminary x-ray examination may prove to be serious, inasmuch as roentgenography may show malignant disease in a location other than in the area of the palpable dominant mass; rarely in the opposite breast. An x-ray report of possible carcinoma in the absence of clinical signs also commands surgical attention. Finally, the status of a dominant mass in the face of an x-ray report revealing no evidence of malignancy must be established by a diagnostic surgical resection. Once it is clearly understood that x-ray examination is not a substitute for biopsy, the situations for which routine roentgenography becomes especially valuable are: (a) to confirm the nature of a dominant mass and to exclude the presence of a malignant lesion elsewhere in the breast; (b)

to exclude the presence of a malignant lesion in diffuse lumpy breasts; (c) in cases of occult cancer, with malignant axillary nodes or nipple discharge or a retracted nipple; (d) in asymptomatic breasts, to screen for small malignant lesions by periodic roentgen re-examination; (e) to study physiologic changes in the breast during and after the reproductive span of life.

#### DISCUSSION

X-ray diagnosis of breast disease is not unlike x-ray examination of the chest. Just as the radiologist has had to train himself to make reliable interpretations of chest films, so is experience required before he gains sufficient skill in the diagnosis of mammary disease. Once this experience has been acquired, the pitfalls of the pro-



Fig. 3. A tiny scirrhous carcinoma in an asymptomatic survey patient. No mass was palpable. A quadrant dissection revealed a tumor  $0.4 \times 0.5$  cm. There were no axillary metastases.

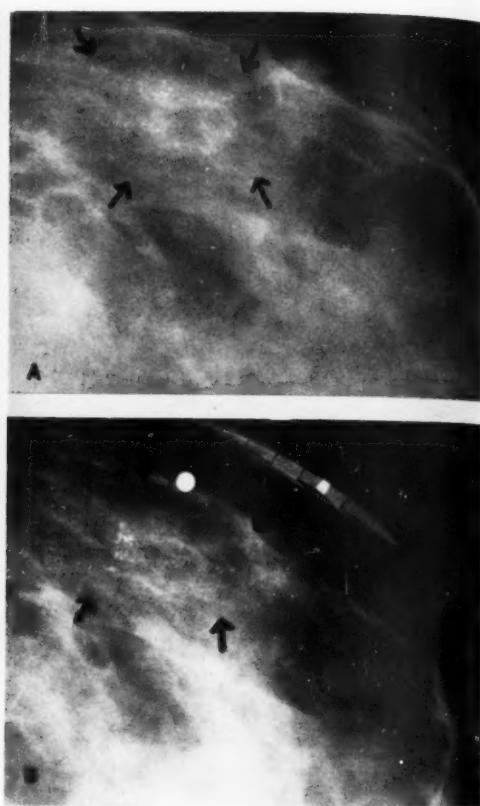


Fig. 4. A nonpalpable carcinoma in an asymptomatic woman observed for fifteen months. A. Though we reported a "probable duct carcinoma," the surgeon decided to follow the patient clinically since there was no palpable mass. B. When surgery was finally performed, no mass was palpable. Because of this, a frozen section was not obtained. The neoplasm was mainly intraductal, with one tiny area of infiltration. The axillary nodes were not involved by metastasis.

cedure will be realized and the degree of accuracy can be fairly high. The most difficult types of breast to examine are that of the young adolescent virgin and that of the adult where the mammary tissue is very dense and compact. In such breasts, unless the x-ray findings are clear-cut, the radiologist is better advised to point out the limitations of his examination and to put the surgeon on guard against accepting the x-ray findings at face value. On the other hand, in the climacteric and atrophic breasts of the aged, with their increased fat content, the x-ray diagnosis becomes easier.

During the past two or three decades, the incidence of cancer of the lungs has steadily increased. While smoking might be one of the factors to account for overall increase in this phenomenon, it is our opinion that the keenness of the radiologist in searching out cancer of the lungs is probably more responsible than any other

single factor for the current prominence of this form of cancer. It is our conviction that, if surgeons come to use the x-ray examination of the breast as a routine procedure, the diagnosis of early mammary cancer will be made more frequently, and that more cases will be discovered without metastasis. Under these circumstances, the excellent surgery now universally practiced should result in much better mortality statistics than at present prevail.

#### SUMMARY

X-ray examination of the breast can achieve a high level of accuracy. With

clear-  
malig-  
than  
are le-  
liable  
cent  
in ac-  
The  
fatter  
diag-

Ma-  
roent-  
small-  
lary  
sions  
In a

Le-  
mas-  
ratio-  
roen-  
sent-  
mali-  
Qua-  
min-  
Isto-  
pro-  
spec-  
juve-  
in a  
e g-  
diag-

roen-

clear-cut findings of a definite benign or malignant lesion, the accuracy is better than 95 per cent. When the x-ray findings are less clear-cut, the diagnosis is less reliable; this is true of approximately 10 per cent of all breast examinations, particularly in adolescents and some young adults. The older the patient, and the larger and fatter the breasts, the easier is the x-ray diagnosis.

Malignant lesions can be uncovered by roentgenography when they are relatively small. In these cases, the incidence of axillary metastases is less than in palpable lesions evident to the patient or the surgeon. In a series of 48 unsuspected or asymptomatic cancers detected by x-ray studies, the

incidence of axillary lymph node metastasis was only 13 per cent in contrast to 64 per cent in cases diagnosed at surgery. From a study of 16 cases with delayed operations, it was found that the x-ray examination was positive from one and a half to four years before the lesions became evident to the patient or the surgeon.

Albert Einstein Medical Center  
Northern Division  
Philadelphia 41, Penna.

#### REFERENCES

1. INGLEBY, H., MOORE, L., and GERSHON-COHEN, J.: A Roentgenographic Study of the Growth Rate of Six Early Cancers of the Breast. *Cancer* 11: 726-730, July-August 1958.
2. COLLINS, V. P., LOEFFLER, R. K., and TIVEY, H.: Observations on Growth Rates of Human Tumors. *Am. J. Roentgenol.* 76: 988-1000, November 1956.

#### SUMMARIO IN INTERLINGUA

#### Roentgenographia e Biopsia in Cancere Mamari

Le examine roentgenographic del mammas pote attinger un alte grado de accuratia. In casos in que le constataciones roentgenographic indica netamente le presentia de un lesion benigne o de un lesion maligne, le accuratia excede 95 pro cento. Quando le resultatos roentgenographic es minus definite, le diagnoses es minus fidel. Isto es ver pro approximativemente 10 pro cento de omne le examenes de mammas, specialmente in adolescentes e a vices in juvene adultas. Quanto plus avantiate in annos le paciente e quanto plus grande e grasse le mammas, tanto plus facile le diagnose roentgenographic.

Lesiones maligne pote esser detegite per roentgenographia quando illos es relative-

mente micre. In tal casos, le incidentia de metastases axillari es minus alte que in casos de lesion palpabile que es evidente pro le paciente mesme o pro le chirurgo. In un serie de 48 nonsuspicite o asymptomatic canceres detegite per studios roentgenographic, le incidentia de metastases al nodos lymphatic axillari esseva solmente 13 pro cento, per contrasto con 64 pro cento in casos diagnosticate post intervention chirurgic. In un studio de 16 casos de operation retardate, il esseva trovate que le examine a radios X habeva essite positive a un periodo de inter un e medie e quattro annos ante que le lesiones deveniva evidente al paciente o al chirurgo.

## Cyst of the Left Triangular Ligament of the Liver<sup>1</sup>

ANDREW K. POZNANSKI, M.D., C.M.

**C**YSTS OF THE HEPATIC ligaments are relatively rare as shown by the fact that only 7 cases could be found in the literature. Four of these were in the falciform ligament (1, 6) and 3 in the ligamentum teres (2, 3, 4). No cases were described in the triangular ligaments.

The falciform ligament is a double layer of peritoneum that goes from the upper and anterior surfaces of the liver to the lower surface of the diaphragm and the back of the linea alba. Its line of attachment divides the liver into left and right lobes. The ligamentum teres is a fibrous cord running in the falciform ligament down to the umbilicus; it is the remnant of the umbilical vein. At the posterior portion of the upper surface of the liver, the left layer of the falciform ligament turns to the left and forms the anterior layer of a triangular fold called the left triangular ligament. This passes from the upper surface of the left lobe to the diaphragm (8).

Brown (1), in reviewing the reported cases of cysts of the hepatic ligaments in 1948, classified them as primary or secondary. The primary cysts can be of lymphatic origin, a developmental defect, or the result of peritoneal inclusion. Geist (5), discussing solitary nonparasitic cysts of the liver, included some cases in the hepatic ligaments. Various classifications of hepatic cysts have been devised, but that of Jones (7) is probably the most widely accepted.

In most of the cases described the cysts were large, some reaching the size of a child's head, and were usually palpable. The diagnosis was not made prior to surgery. In a few cases, roentgen studies of the gastrointestinal and renal systems were done, and in some instances showed extrinsic pressure on the gastrointestinal tract. The symptoms varied somewhat, but a

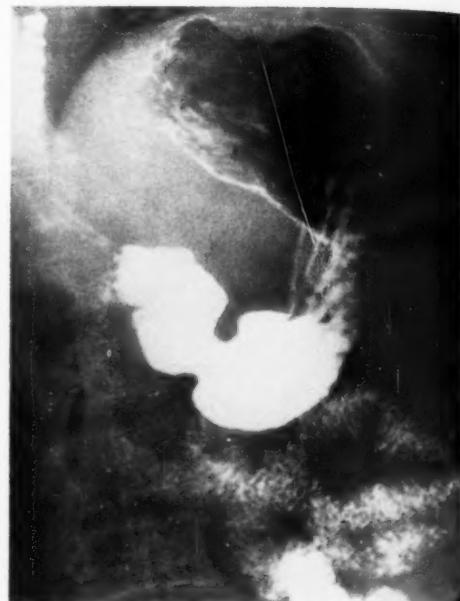


Fig. 1. The fundus of the stomach is distended with air and shows an indentation. There is also a localized elevation of the diaphragm.

number of the patients had pain in the epigastrium, indigestion, or a full feeling most marked after meals. One patient presented with acute symptoms as result of torsion.

Pathologically the cysts were essentially the same except for the case to be reported here, which contained hepatic tissue. There was a thin fibrous connective tissue wall in which muscle fibers were occasionally present. The cysts were in most cases unilocular with a smooth endothelial lining and contained a serous fluid that was clear or slightly cloudy.

### CASE HISTORY

G. B., a 55-year-old white female, complained of heaviness in the epigastrium and burning epigastric pain. The history and physical examination were otherwise not contributory. Roentgen examination

<sup>1</sup> From the Department of Radiology, The Henry Ford Hospital, Detroit, Mich. Accepted for publication in January 1959.

of the upper gastrointestinal tract showed an indentation in the fundus of the stomach. The examination was repeated with air contrast and a defect measuring 2 to 3 cm. was demonstrated, with indentation of the fundus, and also a localized elevation of the diaphragm (Fig. 1). A pneumoperitoneum together with a barium examination of the stomach showed the mass to be separate from the stomach and from the left dome of the diaphragm, but



Fig. 2. Upright film with pneumoperitoneum, showing the mass to be separate from the diaphragm and from the stomach.

attached to the latter by fibrous strands (Fig. 2). Laminagrams in the upright position demonstrated this even more clearly. At subsequent laparotomy a  $3.5 \times 2.0 \times 1.5$ -cm. mass was found within the left triangular ligament of the liver (Fig. 3). It consisted of 3 cystic cavities containing clear white fluid. Microscopically the cyst was lined by a single layer of flattened endothelial-like cells. The surrounding stroma contained myxomatous fibrous tissue, collagen, clusters of parenchymal cells resembling those of the liver, as well as some oval shaped structures which had the appearance of bile ducts.

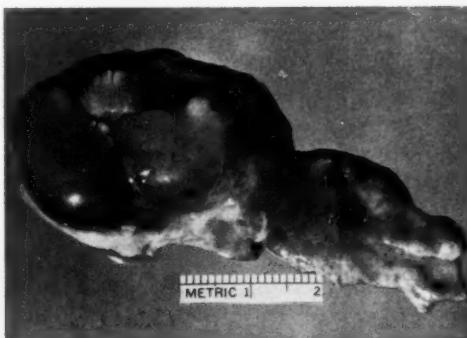


Fig. 3. Specimen removed at surgery.

#### SUMMARY

A case of cyst of the triangular ligament of the liver is presented, which was best demonstrated by the aid of pneumoperitoneum.

The Henry Ford Hospital  
Detroit 2, Mich.

#### REFERENCES

1. BROWN, J. S., JR.: Cysts of the Falciform Ligament. *South. Surgeon* **14**: 278-282, April 1948.
2. WAKELEY, C. P. G., AND MACMILLAN, D. J.: Non-Parasitic Cysts of Liver. Report of Two Cases Together with a Case of Cyst of the Ligamentum Teres Hepatis. *Lancet* **2**: 675-680, Sept. 26, 1931.
3. HENDERSON, M. S.: Cyst of the Round Ligament of the Liver. *Ann. Surg.* **50**: 550-551, 1909.
4. KARABIN, J. E.: Cyst in the Ligamentum Teres of the Liver: Remnant of Umbilical Vein. *Am. J. Surg.* **82**: 531-532, October 1951.
5. GEIST, D. C.: Solitary Nonparasitic Cyst of the Liver; Review of Literature and Report of Two Patients. *Arch. Surg.* **71**: 867-880, December 1955.
6. CHIFOLIAU: Kyste séreux dans la ligament suspenseur du foie. *Bull. et mém. Soc. nat. de chir.* **52**: 1197, Dec. 25, 1926.
7. JONES, J. F. X.: Removal of Retention Cyst from the Liver. *Ann. Surg.* **77**: 68-89, January 1923.
8. Cunningham's Text-Book of Anatomy. New York, Oxford Univ. Press, 9th Ed., 1951, p. 659.

#### SUMMARIO IN INTERLINGUA

#### Cyste del Sinistre Ligamento Triangular del Hepate

Reportos de solmente 7 cistes de ligamentos hepatic poteva esser trovate in le litteratura. Quattro de istos esseva in le ligamento falciforme e 3 in le ligamento terete. Un caso additional es describite in le presente reporto, le prime locate in

le ligamento triangular. Isto esseva demonstrabile le plus clarmente con le adjuta de pneumoperitoneo que revelava que illo esseva separate de stomacho e diaphragma ben que connectite con iste ultime per cordas fibrose.

# A Limited Survey of Radiation Exposure from Medical Fluoroscopes<sup>1</sup>

ROBERT OWEN GORSON, M.S.,<sup>2</sup> JESSE LIEBERMAN, M.S.,<sup>3</sup> and MARVIN GREEN, B.S.

WITH THE CO-OPERATION of the University of Pennsylvania and dentists and physicians of Philadelphia, the Department of Public Health of the City of Philadelphia instituted in 1956 a study of radiation exposure from medical x-ray units. A survey of dental x-ray units has previously been reported (1). The present paper is concerned with the radiation characteristics of fluoroscopes surveyed in the Philadelphia area and some of the problems involved in controlling unnecessary radiation exposure from their use.

## METHOD OF SURVEY

Measurements made on 81 fluoroscopes are included in the present study. Twenty-two units were owned by 8 hospitals<sup>4</sup> and 4 city clinics, and the remaining 59 were in the offices of physicians engaged in private practice. The distribution of the units according to ownership is presented in Table I. They are listed according to type and manufacturer in Table II. Sixty-seven fluoroscopes were located within the city limits of Philadelphia. The other 14 were in eastern Pennsylvania and southern New Jersey. Twenty of the fluoroscopes, owned by hospitals and radiologists, were inspected at the request of the owners. The others, all in Philadelphia, were chosen at random from a list registered by physicians with the Commonwealth of Pennsylvania Department of Health.

A survey and questionnaire form was used to record systematically four categories of information for each fluoroscope: (a) data from the physician concerning age, manner of use, and average work load;

<sup>1</sup> From the William H. Donner Center for Radiology, University of Pennsylvania, Philadelphia 4, Penna., and the Department of Public Health, Division of Environmental Health, City of Philadelphia, Philadelphia 7, Penna. Presented in part at the Forty-fourth Annual Meeting of the Radiological Society of North America, Chicago, Ill., Nov. 16-21, 1958.

<sup>2</sup> Department of Radiology, Hospital of the University of Pennsylvania, and Consultant in Radiological Physics to the Department of Public Health, Philadelphia. Present address: Department of Radiology, Jefferson Medical College Hospital, Philadelphia 7, Penna.

<sup>3</sup> Chief, Occupational Environment Section, Department of Public Health, Philadelphia.

<sup>4</sup> The Hospital of the University of Pennsylvania was not included in the survey.

TABLE I: OWNERSHIP OF FLUOROSCOPES

Number of Owners	Number of Fluoroscopes
14 general practitioners	14
44 specialists	
31 internists	32
3 pediatricians	3
3 radiologists	3
7 others	7
12 institutions	
8 hospitals	18
4 city clinics	4
<b>TOTALS</b>	<b>81</b>

TABLE II: TYPE AND MANUFACTURER

Manufacturer	Number of Fluoroscopes	
	Vertical	Tilting Table
Continental	10	0
Fischer	1	0
General Electric	3	2
Keleket	2	1
Mattern	15	0
North American Philips	0	1
Peerless	3	0
Picker	7	10
Profexray	1	0
Siemens	1	0
Standard	7	4
Westinghouse	9	4
<b>TOTALS</b>	<b>59</b>	<b>22</b>

(b) physical inspection; (c) radiation characteristics; (d) radiation exposure to the physician.

## MEASUREMENT TECHNIC

The technics used to measure the radiation characteristics of the fluoroscopes were adapted with modifications for field use from methods developed and described by Hale *et al.* (2). Measurements were made with the field size of the primary

Fig. for infe  
wall th  
denser  
shown  
chamb  
off wa  
x-ray  
pane  
and  
used  
Ex  
Layer  
radia  
the h  
an in  
of al  
which  
sativ  
dens  
Fig  
ing  
was  
(Fig  
tain  
(2).  
h.v.  
is in  
of t  
with  
3-m  
N  
A  
with  
Bure  
mad

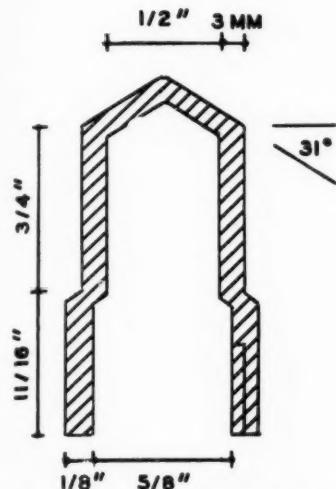


Fig. 1. Cross section through aluminum cap used for inferential h.v.l. determinations. Caps of varying wall thickness were designed to fit Victoreen 25-r condenser ionization chambers; 3 mm. wall thickness, shown here, was found to be most useful. The ratio of chamber reading with cap on to the reading with cap off was calibrated as a function of h.v.l.

x-ray beam adjusted to  $10 \times 10$  cm. at the panel surface or table top. Tube potential and current settings were those normally used by the physician.

*Exposure Dose Rate and Half-Value-Layer Measurements:* The "quality" of the radiation was determined by measuring the half-value layer (h.v.l.) in aluminum by an inferential method (2, 3). The design of aluminum caps,<sup>5</sup> varying in thickness, which were machined to fit over the sensitive volume of the Victoreen 25-r condenser ionization chamber,<sup>6</sup> is shown in Figure 1. The ratio of the chamber reading with cap on to the reading with cap off was calibrated as a function of the h.v.l. (Fig. 2). The calibration curves were obtained by the method previously described (2). It can be seen in Figure 2 that the h.v.l. calibration curve for aluminum caps is independent of tube potential. Most of the h.v.l. determinations were made with caps 2 mm. and 3 mm. thick; the 3-mm. thickness was found to be most

<sup>5</sup> Made of 2S-O aluminum.

<sup>6</sup> All chambers used in this study were intercompared with a secondary chamber calibrated by the National Bureau of Standards. Appropriate corrections were made for all data.

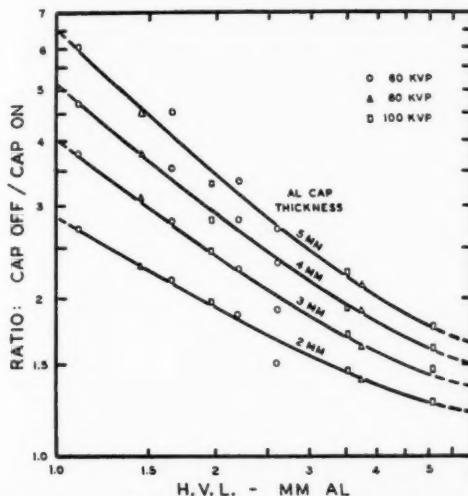


Fig. 2. Calibration of aluminum caps for inferential h.v.l. determinations as a function of cap thickness. Note that calibration is independent of kvp.

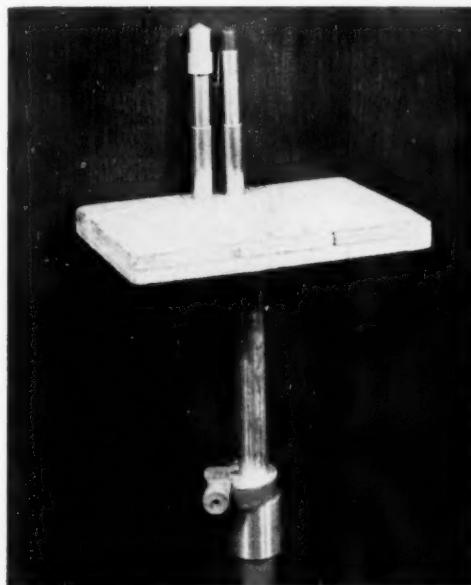


Fig. 3. Victoreen 25-r chambers arranged on adjustable stand to measure the exposure dose rate and h.v.l. of a vertical fluoroscope. One chamber is used for measurement; the other for monitoring fluctuations in exposure dose rate.

satisfactory. A second 25-r chamber was always used as a monitor to avoid uncertainty in measurements due to electrical instability. Readings were taken

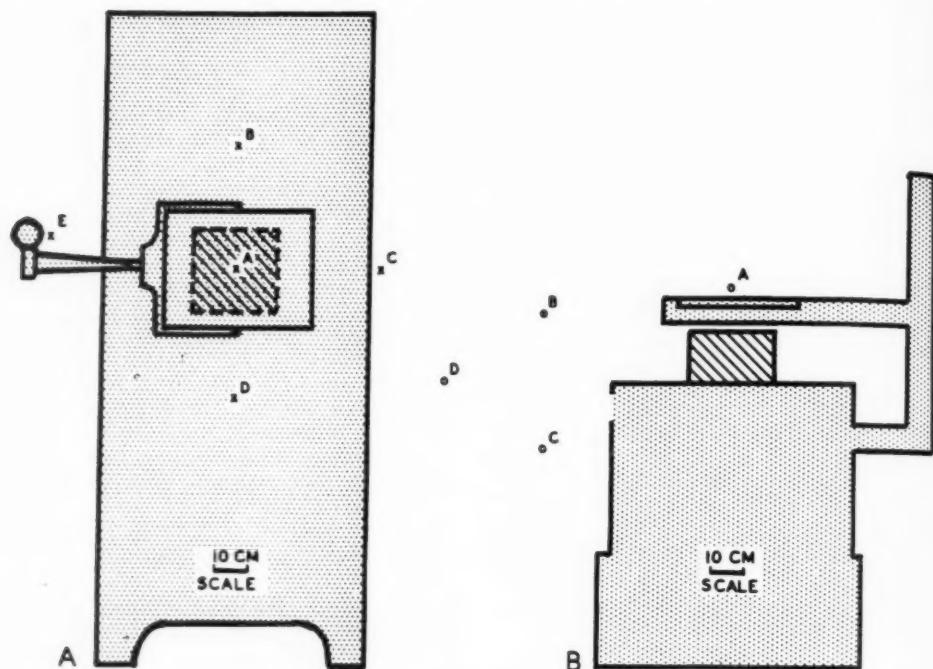


Fig. 4. Location of positions (A, B, C, D, E) for measurement of stray radiation. For vertical fluoroscopes, measurements were made in a plane 20 cm. in front of the screen except for E, at the shutter controls, and for A, at the screen. For horizontal units, measurements were made in a transverse plane through the screen, as shown. Stray radiation index was calculated by doubling reading at A and averaging result with the other readings.

with the chambers positioned in the center of the field in contact with the panel surface. The exposure dose rate at the table top or panel surface was estimated by correcting cap-off readings according to the inverse-square law to the target-panel distance. In Figure 3 are shown the monitor and measurement chambers in position on an adjustable stand for measuring the exposure dose rate and h.v.l. of a vertical fluoroscope.

*Stray Radiation Measurements:* Measurements of scattered and leakage radiation in the immediate vicinity of the fluoroscopes were made with ionization rate meters<sup>7</sup> at certain selected locations (Fig. 4). A block of birch wood, 10 inches square and 6 inches thick, was used as a phantom patient. Except for points A and E, the readings taken on vertical fluoroscopes

were made in a vertical plane 20 cm. in front of the fluorescent screen, with the screen in contact with the phantom (Fig. 4, A). The reading at point A was made with the survey meter in contact with the lead-glass cover over the screen. The reading at point E was taken at the shutter controls. Stray radiation measurements for horizontal fluoroscopes were made in a transverse plane through the screen (Fig. 4, B). In both cases, measurements of transmission through the fluorescent screen also were made without the phantom interposed in the beam. When present, protective devices such as lead-rubber flaps and Bucky slot covers were left in place. The phantom in position on an adjustable stand is shown in Figure 5. A reading is being taken at Point E, next to the shutter controls.

In order to compare the stray radiation hazard of various fluoroscopes, it was use-

<sup>7</sup> The ionization rate meters ("cutie pies") were calibrated with a radium standard.

ful to define a "stray radiation index" (SRI). Since the face of the fluoroscopist is protected only by the lead-glass cover of the screen, the reading obtained at point A (Fig. 4) was considered sufficiently important to be given twice the weight of measurements made at other points. The SRI was calculated by doubling the reading taken at point A and averaging the result with the other readings.

**Film-Badge Survey:** To study the average exposure received by physicians during fluoroscopy, 53 physicians in private practice were given a pair of commercial film dosimeters. Each was instructed to wear one film badge on the right arm and the other on the left shoulder during fluoroscopy and to keep careful records of the total fluoroscopic time and the number of patients examined during the study period. The badges were usually left with the physician for a period of four to five weeks. The study was repeated for about half of the physicians.

#### INFORMATION OBTAINED BY INTERVIEW

The data obtained by interviewing physicians are summarized in Tables I and III. Three-quarters of the physicians in private practice were specialists; 30 had been certified by some American Specialty Board. Fifteen of the 18 hospital units were used only by radiologists. The other 3 were used primarily by cardiologists.



Fig. 5. Measurement of stray radiation at shutter controls (point E) with ionization rate meter. Block of birch wood on adjustable stand behind screen is used as a phantom patient.

The data in Table III indicate that radiologists operate fluoroscopes at higher potentials and lower currents than non-radiologists. Three-quarters of the non-radiologists performed only chest fluoroscopy; most of the remainder undertook

TABLE III: SUMMARY OF INFORMATION OBTAINED BY INTERVIEW

Information	No. of Fluoro- scopes	Range in Values		Mean Value	Median Value
		Maximum	Minimum		
Age of fluoroscope in years					
Radiologists and hospitals	19	20	3	8.3	8
Nonradiologists	58	28	2	11.6	11
Both groups	77	28	2	10.8	10
Tube potential normally used (kvp)					
Radiologists and hospitals	20	86	50	79	80
Nonradiologists	49	85	35	66	65
Tube current normally used (ma)					
Radiologists and hospitals	20	5	2	3.3	3.0
Nonradiologists	56	12	2	4.7	4.5
Estimated number of examinations per week per machine					
Radiologists and hospitals	21	80	1	28	25
Nonradiologists	60	75	0	8.3	3.9
Estimated average patient exposure time: minutes per machine					
Radiologists and hospitals	19	10	2	3.8	3.0
Nonradiologists	60	5	1/30	1.6	1.0

only limited additional procedures, such as examinations of extremities and occasional foreign-body localization. A large fraction of the fluoroscopic examinations done by radiologists were studies of the gastrointestinal tract and other special procedures. It is not surprising, therefore, that the average estimated exposure time per patient is two to three times greater for radiologists than for nonradiologists. Radiologists also averaged three to four times as many examinations per machine per week as nonradiologists. Many nonradiologists stated that they had greatly curtailed the use of their machines during the last two years.

All of the radiologists and all but 8 of the nonradiologists stated that they wore red goggles for varying lengths of time (one to twenty minutes) before fluoroscopy. All of the radiologists and all but 5 of the nonradiologists said that they wore leaded aprons, and all of the radiologists and all but 14 of the nonradiologists possessed leaded gloves. For 2 of the fluoroscopes owned by nonradiologists and 7 of those in hospitals radiation safety evaluations had been made previously by radiologic physicists.

Six of the 8 hospitals were subscribing to a commercial film-badge service at the time of survey. None of the physicians in private practice monitored personnel radiation exposure. All physicians were asked if they had any idea as to the "radiation output" of their fluoroscopes. Answers were given for one-half the hospital units and, of these, all but one proved to be reasonably accurate. A few physicians in private practice thought that the outputs were "low." A great majority did not know and declined to guess.

#### PHYSICAL INSPECTION

The data obtained by physical inspection are summarized in Table IV. The National Committee on Radiation Protection and Measurement (NCRPM) (4) recommends that the distance between the x-ray tube focal spot and the front panel or table top of a fluoroscope be at least 18 inches,

TABLE IV: SUMMARY OF OTHER OBSERVATIONS

Observation	Type of Unit (V) or Tilting- Table (H)	Number of Fluoroscopes		
		Yes	No	Un- known
1. Target-to-panel distance at least 18 inches	V H	2 13	57 9	0 0
2. Manually reset cumulative exposure timer	V H	10 13	49 9	0 0
3. Lead-rubber drapes suspended from screen	V H	9 7	50 15	0 0
4. Bucky slot cover or side board	V H	.. 7	.. 15	0 0
5. Screen and tube ganged together	V H	49 22	10 0	0 0
6. Tube can be energized without screen in position	V H	58 19	1 3	0 0
7. Unilluminated screen margin when shutters fully open	V H	11 2	48 20	0 0
8. Shockproof tube cables	V H	9 14	26 5	24 3
9. Metal tube housing	V H	28 15	10 5	21 4
10. Tube enclosed on all sides	V H	39 15	20 7	0 0

and several State codes (5, 6, 7) require that it be at least 12 inches. About 40 per cent of the horizontal units and 97 per cent of the vertical units had target-to-panel distances measured or estimated to be less than 18 inches. Fifteen per cent of the horizontal fluoroscopes and three-quarters of the vertical units appeared to have target-to-panel distances of 12 inches, or less.

Only 20 per cent of the vertical fluoroscopes and 60 per cent of the tilt-table units were equipped with manually reset cumulative exposure timers (4-7). The range of the timers varied from thirty seconds to sixty minutes. Most were five-minute timers. In two instances, timers failed to terminate the exposure or to give a warning signal at the end of the preset time.

Only 15 per cent of the vertical fluoroscopes had accessory protective shielding around the fluorescent screen. One-third of the tilt-table units were provided with lead-impregnated drapes suspended from the screen and Bucky slot covers or side

TABLE V: SUMMARY OF RADIATION CHARACTERISTICS  
(Fifty-nine vertical and twenty-two tilting table or horizontal fluoroscopes)

Observation or Calculation	Range in Values		Mean Value	Median Value
	Maximum	Minimum		
Exposure dose rate in air at panel surface, in r per min.				
Radiologists and hospitals	46.7	1.8	8.9	7.1
Nonradiologists	63.6	2.2	16.3	12.9
Both groups	...	...	14.4	10.0
Half-value layer in millimeters of aluminum				
Radiologists and hospitals	3.7	1.8	2.9	3.1
Nonradiologists	>4.0	<0.5	1.9	1.8
Both groups	...	...	2.1	2.0
Stray radiation index: mr per hour				
Radiologists and hospitals	715	1	139	83
Nonradiologists	372	5	97	75
Both groups	...	...	107	80
Transmission through fluorescent screen shield (no phantom): mr per hour				
Radiologists and hospitals	60	3	18	15
Nonradiologists	120	<2	11	3
Both groups	...	...	12	5

boards, most of which were custom made.

Items 5, 6, and 7 in Table IV represent features preventing the fluoroscopist from accidentally intercepting any part of the primary x-ray beam. The fluorescent screen and x-ray tube were ganged together in all fluoroscopes except 10 vertical units used for orthodiascopy, which requires independent motion of the tube. In all but 4 units (3 tilt-table units with electric interlock switches and 1 vertical unit with screen and tube in fixed positions) it was possible to energize the machine with the screen rotated out of position so that the primary x-ray beam would not be intercepted by it. Item 7 is based on the NBS *Handbook 60* recommendation (6.1.b.) that "the useful beam shall be limited by a cone and an adjustable diaphragm that, when open to its fullest extent, leaves a margin of at least one-quarter inch of unilluminated fluorescent screen regardless of screen position during use" (4). This recommendation has been adopted as a requirement in several State radiation protection codes (5, 7). For the great majority of fluoroscopes examined, a position could be found in which this requirement was not fulfilled, if the regulation were interpreted literally.

For this study, it was necessary to rely on the judgment of the field inspector re-

garding a reasonable range in "screen position during use." A panel-to-screen distance of 35 to 40 cm. was considered the maximum for normal use, except for orthodiascopes, for which the distance is usually fixed at about 50 cm. Only 13 of the 81 fluoroscopes met the unilluminated margin requirement within this range. However, to the extent that the physician exercises reasonable care in limiting the field size and direction of the primary beam, the majority of the other 68 units were not considered unduly hazardous in this respect.

In most cases the amount of added aluminum filter could not be determined without extensive disassembly of the fluoroscope. This was not attempted. It was also impractical to determine whether the tube housing satisfied the definition of "diagnostic tube housing." However, whenever the tube housing could be seen through the available apertures in the side or back panels with the aid of a flashlight, note was made as to whether the tube appeared to be enclosed in a metal tube housing and whether high-tension cables appeared to be insulated. As indicated by items 8 and 9 in Table IV, many fluoroscopes did not have metal tube housings or shockproof cables. About two-thirds of the units were enclosed by panels on all sides.

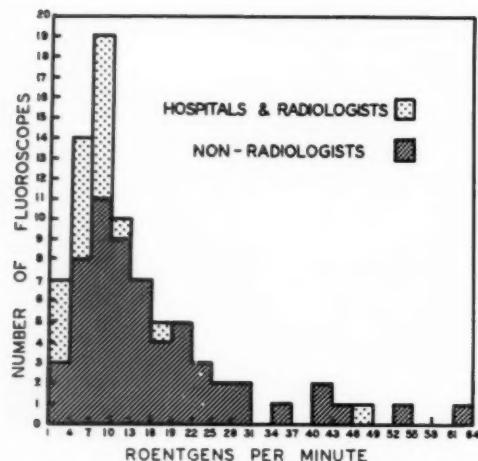


Fig. 6. Distribution of exposure dose rates measured in air at the panel surface with the field size adjusted to  $10 \times 10$  cm. at the panel and the fluoroscope operated at normal kvp and ma settings.

#### RADIATION MEASUREMENTS

**Exposure Dose Rate:** The distribution of the exposure dose-rate measurements made in air at the fluoroscope table top or panel surface is plotted in Figure 6 and summarized in Table V. Half of all the fluoroscopes (14 per cent of those owned by radiologists and hospitals and 63 per cent of those owned by nonradiologists) failed to meet the requirement that the exposure dose rate not exceed 10 r per minute for routine fluoroscopy (4-7).

A comparison of these results with data of Braestrup (8), Sonnenblick (9, 10), and Valaer and Zavon (11) is shown in Table VI. Braestrup's measurements were made on fluoroscopes in New York City hospitals. Sonnenblick's surveys were made on fluoroscopes in New York City and northern New Jersey, and most of the units tested were owned by private practitioners, one-third of whom were pediatricians.

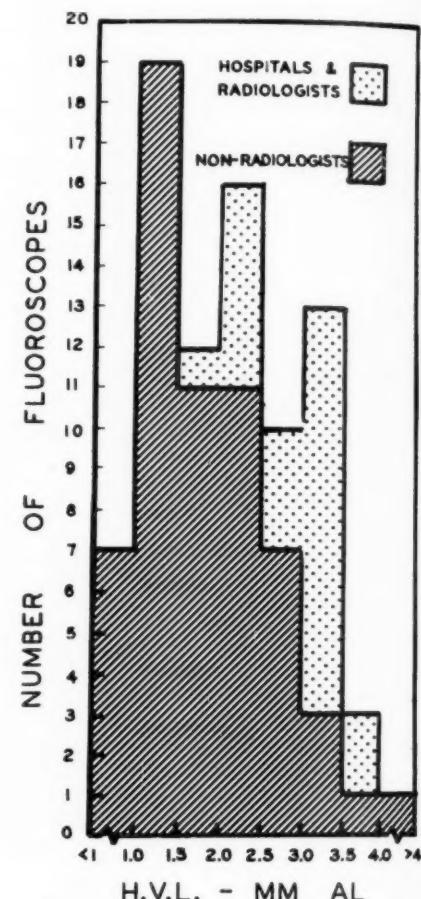


Fig. 7. Distribution of h.v.l. determinations made with field size adjusted to  $10 \times 10$  cm. at the panel and with fluoroscope operated at normal kvp and ma settings.

Valaer and Zavon limited their study to fluoroscopes used by pediatricians in the Cincinnati area. Their measurements show an average exposure dose rate of about 14 r per minute at the panel surface, in close agreement with the results of this study.

TABLE VI: COMPARISON WITH RESULTS OF OTHER SURVEYS

Author	Date	Number of Fluoroscopes	Range in r/min. at Panel Surface	Percentage of Units Exceeding 10 r/min.
Braestrup (8)	1941	37	7-127	90
Sonnenblick (9, 10)	1951-1954	119	3-118	80
Valaer and Zavon (11)	1957	34	2-38	65
Gorson, et al. (1)	1958	81	2-64	50

**Half-Value Layer:** The distribution of the radiation "quality" as expressed in terms of measured h.v.l. in millimeters of aluminum is plotted in Figure 7 and summarized in Table V. The results indicate that for fluoroscopes used by nonradiologists the h.v.l. is considerably less than that of machines used by radiologists. A minimum h.v.l. of 2.5 mm. of aluminum under normal operating conditions was considered acceptable (2). About 30 per cent of the fluoroscopes owned by hospitals and radiologists and 80 per cent of the units owned by nonradiologists failed to meet this criterion.

**Stray Radiation Measurements:** The distribution of the stray radiation index (SRI) measurements is plotted in Figure 8 and summarized in Table V. The higher average SRI for fluoroscopes owned by hospitals and radiologists is undoubtedly due to the higher tube potentials and h.v.l. used by these groups and the fact that all but one of the units were of the tilting type. Stray radiation readings are generally lower for vertical fluoroscopes than for horizontal units without accessory shielding because the measurements are taken behind rather than to the side of the fluorescent screen.

Studies of the scattered radiation patterns around fluoroscopes and analyses of pertinent parameters have been reported by others (12-14). Additional data concerning the relationship between the SRI and the other radiation characteristics for a vertical fluoroscope and a tilting table unit are summarized in Table VII. The SRI

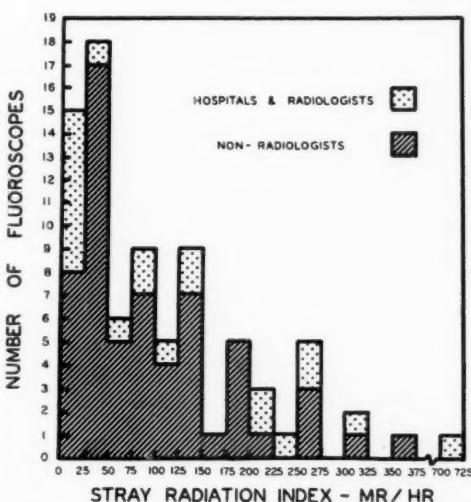


Fig. 8. Distribution of SRI calculations derived from measurements as illustrated in Figs. 4 and 5. Measurements made with field size adjusted to  $10 \times 10$  cm. at panel surface with phantom patient and with fluoroscope operated at normal kvp and ma settings.

measurements were made with all accessory protective shielding removed and the results indicated that the scattered radiation levels increased with kvp or h.v.l. For tilting-table units used in a horizontal position, the SRI can easily be reduced to less than 5 mr per hour (or less than 1 mr per hour per r per minute at the table top) by the use of accessory shielding such as Bucky slot covers, side boards, and lead-rubber flaps suspended from the screen between the patient and the fluoroscopist. The effectiveness of such accessory shielding has been demonstrated by Hale *et al.* (2).

TABLE VII: RELATION BETWEEN STRAY RADIATION INDEX (SRI) AND OTHER RADIATION CHARACTERISTICS

Fluoroscope Operated at 3 ma	Kvp	H.V.L. mm. Al	r/min. in Air at Panel	Lead- Glass Trans- mission, mr/hr.	SRI, mr/hr.	SRI per r/min. Panel
A. Vertical fluoroscope with 10-inch target-to-panel distance. Added filter: 2.7 mm. Al	"Low" (64)	2.3	5.2	<2	66	12.7
	"Med." (73)	2.6	7.5	3	120	16.0
	"High" (85)	3.2	10.0	28	184	18.4
B. Tilting table fluoroscope in horizontal position with 20-inch target-to-table-top distance, open Bucky slot, and no lead-rubber flaps. Dynamax 46. Added filter: 2.0 mm. Al	65	1.8	1.7	<2	15	8.8
	75	2.0	2.7	<2	34	12.6
	85	2.7	4.0	2	62	15.5
	95	3.1	5.3	10	115	21.7

TABLE VIII: SUMMARY OF FILM-BADGE AND WORK-LOAD STUDY  
(Twenty-six fluoroscopes used by nonradiologists in private practice)

Observation or Calculation	Range in Values		Mean Value	Median Value
	Maximum	Minimum		
Period of study (weeks)	17	4	7.8	7
Work load:				
Patient examinations per machine per week	30	0.2	3.8	3.5
Minutes of fluoroscopy per machine per week	75	0.3	6.5	2.7
Average patient exposure per machine (minutes)	3.2	0.1	1.7	1.1
Physician film-badge study				
Mr per minute of fluoroscopy				
Right arm	11	<0.1	1.5	0.5
Left shoulder	7.5	<0.1	1.1	0.5
Mr per week				
Right arm	80	<0.1	4.8	1.2
Left shoulder	16.5	<0.1	2.2	1.0

#### Screen Transmission Measurements:

The results of exposure dose rate measurements made above the screen are summarized in Table V. The readings were taken with mobile screens set 6 inches from the panel, with normal ma and kvp settings, and without the phantom in the beam. Similar measurements for two control units are listed in Table VII. Readings of less than 20 mr per hour under normal operating conditions were considered acceptable (2). Seventeen per cent of the fluoroscopes (9 vertical units and 5 tilting-table units) failed to meet this criterion.

*Film-Badge Survey and Work-Load Study:* Machine work load and personnel exposure data sufficient for analysis were obtained from 27 of 53 physicians in private practice. The results are summarized in Table VIII. An average of about four patient examinations were performed per machine per week during the study period, or about half the average number estimated by the nonradiologists during interviews (Table III). The average recorded patient-exposure time of about two minutes generally agrees with the average estimated value obtained by interview. A majority of the units were operated for less than three minutes a week. Valaer and Zavon obtained similar results in a time-of-use study on 29 fluoroscopes used by pediatricians (11). The film-badge readings generally were very low, with an average value of about 5 mr per week for the right arm and 2 mr per week for the left shoulder. These findings are consistent with the average SRI of about 1.6 mr per minute.

#### DISCUSSION

The primary objectives of this study were to obtain new data regarding the potential hazard of fluoroscopes, to test certain radiation measurement techniques for field use, and to determine the extent to which fluoroscopes meet the requirements of radiation protection codes and recommendations of the NCRPM. For discussion of the results and some of the difficulties encountered, two aspects of the study should be considered separately. The first concerns the construction and radiation characteristics of the fluoroscope; the second pertains to the manner of its use.

*A. Radiation Characteristics:* The potential radiation hazard of a fluoroscope is a function of its inherent radiation characteristics, and these, in turn, depend upon machine design. Hence the safety of a fluoroscope may be judged either by its radiation characteristics or by its design and construction. In practice, however, it is difficult to check some of the NCRPM recommendations or requirements of State codes as to design. Thus, the authors found it impractical to measure total filtration, type of tube housing, maximum field size, lead equivalence of barriers, and any specifications dependent upon maximum continuous kvp and ma ratings. Fortunately, many fluoroscopes which do not meet certain specifications are not necessarily hazardous. In the authors' experience, however, it is both necessary and sufficient to demonstrate that fluoroscopes meet reasonable performance standards.

In this study, the authors have found that the following measurement criteria, consistent with performance recommendations of NBS *Handbook 60*, are practical for field evaluation of fluoroscopes and are sufficient to assure a reasonable degree of inherent radiation safety.

As measured under normal operating conditions and with the field size adjusted to  $10 \times 10$  cm. at the panel surface:

(a) The h.v.l. in aluminum of the useful beam should be at least 2.5 mm.

(b) The exposure dose rate at the panel or table-top surface should not exceed 10 r per minute.

(c) The exposure dose rate above the fluorescent screen should not exceed 20 mr per hour (without patient or phantom and with the screen at a distance of 15 cm. from the panel surface if it is not in a fixed position).

(d) The SRI should not exceed 50 mr per hour as measured with a specified phantom patient such as the one used in this survey.

(e) No part of the primary beam should extend beyond the limits of the primary x-ray barrier with the beam centered on the fluorescent screen and with the screen at a distance of 35 cm. from the panel surface, unless the distance is otherwise fixed.

Twenty-five per cent of the fluoroscopes (14 hospital units and 6 owned by nonradiologists) met the first two performance standards. Of these, only 10 (7 hospital units and 3 owned by nonradiologists) also met the next two standards. At the beginning of the survey, an attempt was made to apply the requirement for unilluminated screen margin. As discussed above, this criterion is now thought to be less useful than the recommended performance standard (e). Accordingly, the number of fluoroscopes in the survey that would have met all of the recommended performance criteria is not precisely known but is probably not more than a half dozen. Nevertheless, about 50 per cent of the fluoroscopes in the survey were considered not unduly hazardous, and it is estimated that at least 90 per cent can

easily be made acceptable by one or more of the following modifications: (a) the addition of aluminum filtration; (b) decreasing the maximum possible ma setting; (c) decreasing the maximum range in shutter opening; (d) adding accessory protective shielding. In a few machines it may also be necessary to increase the distance between the panel and the x-ray tube and to replace old fluorescent screens.

If design specifications that could be checked are also used to judge the fluoroscopes in this survey, then only 2 (hospital) units were acceptable by the maximum recommendations of NBS *Handbook 60*.

The authors feel that unnecessary confusion could be avoided if radiation safety codes were to make clear distinction between design requirements and performance standards. Design specifications are of value for the manufacturer of new equipment but are of limited use in the field testing of fluoroscopes. Minimum performance standards, however, can be applied in the safety evaluation of all fluoroscopes regardless of original design. It would seem desirable, therefore, for State codes containing detailed regulations to limit design specifications to medical and dental x-ray equipment manufactured, sold, or resold after a suitable future date and to require that fluoroscopes in present use be modified only to the extent necessary to meet minimum performance standards. These requirements should be consistent with recommendations of the NCRPM and should be uniform among the States to avoid unnecessary costs to the manufacturer.

**B. Manner of Use:** In radiography the patient exposure is limited, to a large extent, by the acceptable density of the roentgenogram. Faulty radiographic technics are generally easy to spot and correct. There is no technical restriction, however, to limit excessive patient exposure from poor fluoroscopic technic. The manner in which a fluoroscope is used depends upon the prudence, skill, and training of the physician and involves numerous variables, many of which are

difficult to assess. Some of the factors which are important in limiting radiation exposure to both patient and physician are summarized as follows:

1. *Dark Adaptation:* The importance of becoming thoroughly dark-adapted before commencing a fluoroscopic examination has been documented in detail in the excellent studies by Chamberlain and Henny (15). Although most physicians in this study indicated that they do take time to dark-adapt, many admittedly spend much less than ten minutes, the minimum recommended time (16).

2. *Time:* It is important to keep the x-ray beam on only as long as necessary and to reserve fluoroscopy largely for observation of the dynamics of motion (16). Many of the private practitioners interviewed in this study said that they are now doing much less fluoroscopy than they were several years ago, indicating a reduction in the use of their machines for survey and screening purposes.

3. *Field Size:* Keeping the primary beam size to a minimum consistent with the requirements of the examination is of importance not only for minimizing the integral dose to the patient, but for limiting the amount of radiation scattered to other parts of the body, to the physician, and to the fluorescent screen.

4. *Tube Current and Operating Potential:* The results of this survey indicate that many physicians in private practice tend to fluoroscope with low kvp and high ma settings. A number of authors have demonstrated that to reduce patient exposure, it is best to use *high kvp* (*i.e.*, high h.v.l.) and *low ma* settings (12, 13).

5. *Accessory Shielding:* There are still a number of physicians who disregard the wearing of leaded aprons and gloves and the use of other protective accessories because they have observed no personal ill effects from the omission of these precautions. The present study is encouraging, however, in that the great majority of the physicians interviewed at least had protective aprons and gloves and most claimed to use them.

On the basis of this study, the authors would agree with Powell (17) and other authorities that techniques of fluoroscopy and manner of use of the apparatus are not accessible to control by regulatory legislation and inspection. Improvement in standards of fluoroscopic practice, which requires the physician's active co-operation, founded on education and understanding, will continue to evolve primarily through the educational efforts of medical groups and institutions (17-22).

#### SUMMARY

1. The results of a survey of radiation characteristics and manner of use of 81 fluoroscopes owned by hospitals and private practitioners are analyzed. Survey techniques consisted of interviews with the physician, physical inspection of the fluoroscope, and radiation measurements.

2. Measurement techniques and methods of survey are described. Practical difficulties in applying some requirements of radiation protection codes are discussed. It is suggested that distinction be made in regulatory codes between design specifications and performance standards, with the former applying to the manufacture and sale of fluoroscopes and the latter applying to fluoroscopes in use.

3. A set of radiation performance standards, derived from and consistent with recommendations of the NCRPM, are proposed as practical guides for field evaluation of the radiation safety of fluoroscopes.

4. Only 2 fluoroscopes met all the design and performance recommendations of NBS *Handbook 60* and it is probable that none would have satisfied all of the requirements of some radiation protection codes.

5. About 7 per cent of the fluoroscopes were judged satisfactory by the proposed performance standards. However, almost half of the units produced an exposure dose rate of less than 10 r per minute at the panel surface, under normal conditions of use, and were not considered unduly hazardous.

6. Fluoroscopes used by hospitals and radiologists produced, on the average, radiation at lower exposure levels (8.9 r per minute) and higher h.v.l. (2.9 mm. of Al) than those used by nonradiologists (16.3 r per minute and 1.9 mm. of Al).

7. Fluoroscopes owned by hospitals and radiologists were operated, on the average, at lower ma (3.3) settings and higher kvp (79) settings than those used by nonradiologists (4.7 ma and 66 kvp).

8. Although many fluoroscopes produced unnecessary amounts of stray radiation, the average exposure of physicians in private practice appeared to be very low (5 mr per week to the right arm and 2 mr per week for the left shoulder) due to the low average work load (6.5 minutes per week).

9. Interviews with nonradiologists indicate that most of them limit fluoroscopic examinations to the chest, and many have recently curtailed the use of fluoroscopy.

10. It is estimated that over 90 per cent of the fluoroscopes could be made acceptable by one or more of the following modifications: adding more aluminum filtration, decreasing maximum ma setting, decreasing maximum shutter opening, and adding accessory shielding.

**ACKNOWLEDGMENTS:** We are pleased to acknowledge the willing co-operation of the physicians whose fluoroscopes were surveyed in this study. We also express our appreciation to Mr. Aldo Faccia, Mr. Morris D. Kramer, Mr. David Kusner, Mr. Stephen J. Pijar, and Mr. Edward Weiner for technical assistance in conducting the survey, and to Dr. Richard H. Chamberlain and Dr. John Hale for their advice and encouragement.

Jefferson Medical College Hospital  
Philadelphia 7, Penna.

#### REFERENCES

- GORSON, R. O., HALVORSEN, R. M., LIEBERMAN, J., AND AITKEN, E. V.: A Limited Survey of Radiation Exposure from Dental X-ray Units. *Radiology* **72**: 1-12, January 1959.
- HALE, J., KUSNER, D. B., GORSON, R. O., AND BARTSCH, J. R.: Radiation Safety Evaluation of Fluoroscopes. *Radiology* **71**: 227-234, August 1958.
- NEWELL, R. R., AND HENNY, G. C.: Inferential Kilovoltmeter Measuring X-ray Kilovoltage by Absorption in Two Filters. *Radiology* **64**: 88-93, January 1955.
- X-ray Protection. National Bureau of Standards Handbook 60, 1955.
- Department of Health, Commonwealth of Pennsylvania. Regulation 433, Radiation Protection, 1956, as Amended November 1958.
- Department of Health, New York State, The Sanitary Code, Chapter XVI. Regulation 1 (1955).
- Michigan Department of Health. Regulations Governing the Use of Radioactive Isotopes, X-Radiation and all Other Forms of Ionizing Radiation. February 1958.
- BRAESTRUP, C. B.: X-ray Protection in Diagnostic Radiology. *Radiology* **38**: 207-216, February 1942.
- SONNENBLICK, B. P., LEVINSON, L. J., FURST, N. J., AND KOCH, J.: The Roentgen Output of Fluoroscopes in Routine Diagnostic Practice. *J. Newark Beth Israel Hospital* **2**: 153-163, July 1951.
- SONNENBLICK, B. P.: On Some Aspects of the Problem of Human Radiation Protection. *J. Newark Beth Israel Hospital* **6**: 31-42, January 1955.
- VALAER, P. J., AND ZAVON, M. R.: Radiation Exposure of Pediatricians. *Am. Indust. Hyg. A. Quart.* **18**: 35-41, March 1957.
- MORGAN, R. H.: Physical Problems of Fluoroscopy and Spot-Film Radiography. *Radiology* **52**: 786-794, June 1949.
- HUNTER, F. T., MERRILL, O. E., TRUMP, J. G., AND ROBBINS, L. L.: Protection of Personnel Engaged in Roentgenology and Radiology. *New England J. Med.* **241**: 79-89, July 21, 1949.
- CEDERLUND, J., LIDÉN, K., AND LINDGREN, M.: Distribution of Scattered Radiation in a Fluoroscopic Room. *Acta radiol.* **44**: 457-466, December 1955.
- CHAMBERLAIN, W. E.: Fluoroscopes and Fluoroscopy. Carman Lecture, 1941. *Radiology* **38**: 383-413, April 1942.
- CHAMBERLAIN, R. H.: A Practical Manual on the Medical and Dental Use of X-rays with Control of Radiation Hazards. Prepared with the assistance of R. J. Nelsen and the Commission on Units, Standards, and Protection, American College of Radiology. Chicago, American College of Radiology, 1958.
- POWELL, C. C.: The Government Looks at Radiation Hazards. *Radiology* **72**: 489-492, April 1959.
- RAVENTOS, A.: X-rays are Good for People. Editorial. *Pennsylvania M. J.* **61**: 378-379, March 1958.
- CHAMBERLAIN, R. H.: Radiation Protection Comes of Age. *J.A.M.A.* **153**: 488-491, Oct. 3, 1953.
- TAYLOR, L. S.: Education in Radiation Protection. Janeway Lecture, 1954. *Am. J. Roentgenol.* **73**: 193-202, February 1955.
- HODGES, P. C.: Health Hazards in Diagnostic Use of X-ray. *J.A.M.A.* **166**: 577-584, Feb. 8, 1958.
- NEWELL, R. R.: Common Sense Evaluation of Radiation Exposure in Clinical Radiology. *Am. J. Roentgenol.* **80**: 917-925, December 1958.

#### SUMMARIO IN INTERLINGUA

#### Un Enquete, de Compasso Restringite, del Exposition Radiational ab Fluoroscopios Medical

Es analysate le resultados de un enquete del characteristicas de radiation e del modo de empleo de 22 fluoroscopios in

9 hospitales e 4 clinicas municipal e de 59 fluoroscopios in le possession de medicos private. Le technica usate in le enquete

includeva interviews con le medicos, le examine physic del apparatus, e mesuraciones de radiation.

Es discutite le difficultates del application de certes del requerimientos in le codices de protection contra le radiation. Solmente 2 del fluoroscopios satisfaceva omne le recommendationes de construction e manipulation continite in le Manual 60 del Bureau National de Standards, e il es probabile que nulle del fluoroscopios haberea satisfacite omne le requerimientos de certe altere codices de protection contra le radiation. Tamen, 7 pro cento del fluoroscopios investigate esseva considerate como satisfactori secundo le proponite standards de funcionamento que ha essite derivate ab le recommendationes del Committee National pro le Protection Contra le Radiation. Es sugerite que un distinction debe esser facite in le codices regulatori inter iste standards e le specificationes de construction que es applicabile al fabrication e al vendita del machinas.

A generalmente parlar, le fluoroscopios in le possession de hospitales e de specialistas de radiologia esseva usate a plus basse nivello de milliampere (3,3) e a plus alte nivello de kvp (79) que le fluoroscopios in le possession de medicos non-specialista de radiologia (4,7 ma e 66 kvp).

Le prime de iste gruppis de fluoroscopios produceva, al media, radiation a plus basse nivello de exposition (8,9 r per minuta) e con plus alte spissitatis de medie valor (2,9 mm de Al) que le secunde (16,3 r per minuta e 1,9 mm de Al).

Ben que multes del fluoroscopios produceva quantitates innecessariamente alte de radiation disperse, le exposition medie del medicos de practica private pareva esser multo basse (5 mr per septimana al bracio dextere e 2 mr per septimana al spatula sinistre). Le explication de isto es le infrequeute empleo del apparatus.

Es estimate que plus que 90 pro cento del fluoroscopios studiate poterea esser rendite acceptabile per un o plures del sequente modificationes: Augmentar le filtration de aluminio; reducer le maximo del milliamperage; reducer le apertura maximal del obturator; e adder al armatura accessori.

Le autores opina que le technicas fluoroscopic e le modo de lor uso non pote esser regulate per le medios de legislation e inspection. Le melioration del standards de practica fluoroscopic require le coope ration active del medico. Illo resulta de education e comprension e va continuar evolver se primarimente per le effortios de gruppis e institutiones medical.



## Design of Free-Air Ionization Chambers

for the Soft X-Ray Region (20-100 kv)<sup>1</sup>

VICTOR H. RITZ, B.S.

THE ROENTGEN HAS been recommended (1) by the International Commission on Radiological Units and Measurements as the unit of exposure dose. A measurement with a free-air ionization chamber is the most convenient way of accurately determining exposure dose in the soft x-ray region. Design criteria for standard free-air chambers have been summarized by Wy-

was undertaken to provide design criteria for 20 to 100-kv radiation with filtration ranging from 2 mm. of beryllium to 2 mm. of beryllium plus 4 mm. of aluminum.

A typical free-air ionization chamber is shown schematically in Figure 1. The roentgen is defined in terms of the ionization produced by the interaction of the x-ray beam with a specified mass of air (1).

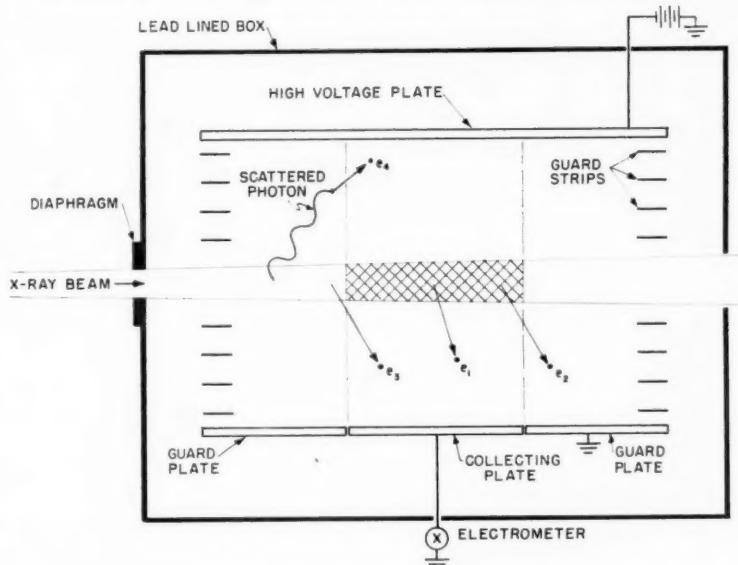


Fig. 1. Schematic top view of a typical free-air ionization chamber.

ckoff and Attix (2) in National Bureau of Standards *Handbook 64* for moderately and heavily filtered x-rays generated at potentials from 50 to 500 kvep. Agreement to about 0.5 per cent has been reached in international intercomparisons of the roentgen in this energy region. In intercomparisons involving lightly filtered low-energy x-rays, however, differences of 1 per cent or more have been observed (3, 4). The present experiment

In practice, however, one defines a volume represented in Figure 1 by the cross hatched region. The cross-sectional area of the volume is determined by the diaphragm, and the length of the collecting region by the length of the collector and by the electric field between the high-voltage and collecting plates. The presence of the grounded lead box tends to distort the electric field in the collecting region, but guard plates and guard strips can be used

<sup>1</sup> From the National Bureau of Standards, Washington, D. C. Presented at the Forty-fourth Annual Meeting of the Radiological Society of North America, Chicago, Ill., Nov. 16-21, 1958.

This work was partially supported by the United States Atomic Energy Commission.

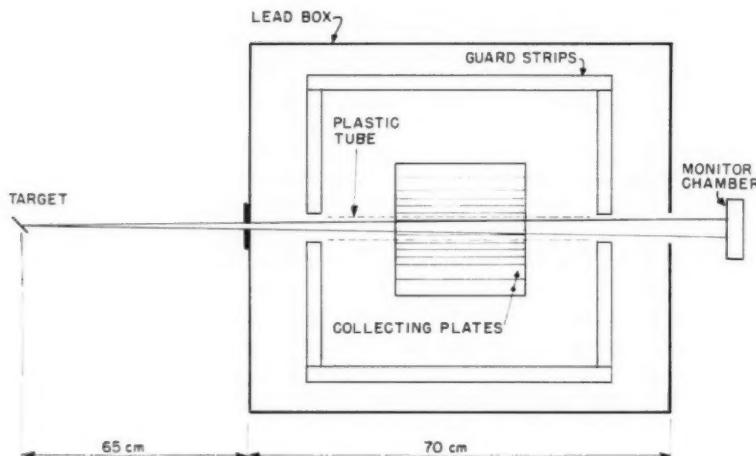


Fig. 2. Side elevation of the experimental set-up.

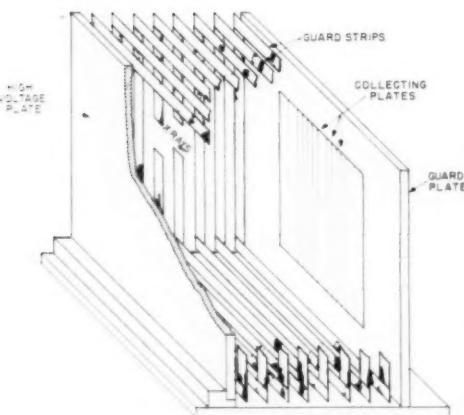


Fig. 3. View of experimental free-air chamber with collectors in position for the field distortion study.

to eliminate such distortion. The guard strips are uniformly spaced between the ground and high-voltage plates and are parallel to them. The potentials of the strips are fixed by a resistor network to give a linear potential gradient between the plates. Distortion can also be caused by the guard strips themselves. This effect becomes important when the strips are close to the edge of the collector or when the centerline-to-centerline spacing between adjacent strips is large.

The x-ray beam interacts with the air to produce electrons like  $e_1$ , which produce

ionization in the collecting region. The precise determination of the roentgen requires that such electrons expend their energy in the air before striking the high-voltage or collecting plates. Thus the proper design of a free-air chamber requires a knowledge of the range of these primary electrons. Electrons like  $e_2$  cause ionization outside the collecting region, but under conditions of electronic equilibrium this loss is compensated by electrons like  $e_3$ . Conditions may also exist in which a photon is scattered out of the primary beam and interacts to produce an electron like  $e_4$ . This represents a contribution that is not included in the definition of the roentgen. This scattered photon contribution must be determined and subtracted from the total ionization measured by the chamber.

Another correction to be applied to a free-air chamber is for the attenuation of the x-ray beam by the air between the diaphragm and the center of the collector. This correction becomes quite large in the soft x-ray region and is, in fact, the largest single correction to be applied to the free-air chamber. The air attenuation correction can be reduced by decreasing the length of the air path between the diaphragm and collector. This, however, increases the distortion caused by the guard-strip system. In practice the reduction

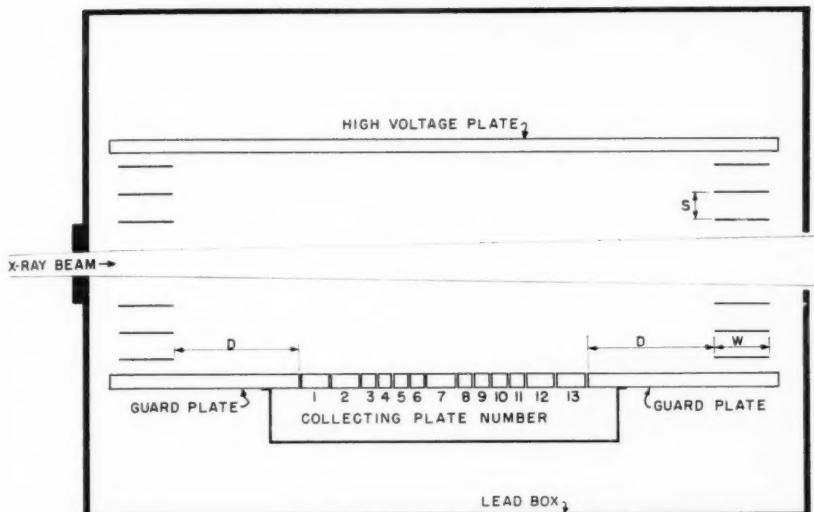


Fig. 4. Section through the chamber, viewed from above, as used in the field-distortion study. The collecting strips number 1, 2, 7, 12, and 13 were 0.5 in. wide, the remaining strips were 0.25 in. wide. D is the distance from the edge of the collecting plate assembly to the guard strip system; S is the centerline-to-centerline spacing of the guard strips. W is the depth of the guard strips.

in the length of air path is limited by the field distortion.

This paper will discuss: (a) the distortion of the electric field in the collecting region by the guard-strip system, (b) the range of primary electrons like  $e_1$  and the scattered photon contribution, and (c) other corrections, such as air attenuation, which are particularly important in the soft x-ray region.

#### APPARATUS

A side elevation view of the experimental arrangement is shown in Figure 2. A tungsten-target x-ray tube with a beryllium window 2 mm. thick was operated at exciting potentials of 20 to 100 kVp. The kilovoltage was monitored manually throughout the experiment, and errors because of fluctuations in output were avoided by the use of a monitor chamber placed behind the experimental chamber.

The experimental free-air chamber is shown in Figures 2-4. The thirteen aluminum collecting plates were insulated from each other by narrow air gaps (0.125 to 0.25 mm. wide) and from ground by a polyethylene insulator. They could be grounded or connected to the charge-

measuring system by means of low-noise coaxial cables that passed through the lead box to a terminal box. The collecting plate assembly was machined as a unit until it was flat, to about 0.0025 mm., to avoid field-distortion effects due to the collectors themselves (2). A thin coat of colloidal graphite was put on the collectors to eliminate contact potentials (2). The collecting plates could be turned so that their long axes were vertical for the field-distortion study (Figs. 3 and 4) or horizontal for the electron-range and photon-contribution studies (Fig. 2). Vibrating reed electrometers were used as null detectors (2) to measure the ionization currents in the experimental chamber and monitor.

The guard-strip system shown in Figures 3 and 4 consisted of brass strips separated by Bakelite spacers, surfaces of which were made conducting with colloidal graphite and then scribed with a fine line to insulate adjacent guard strips. This minimized the amount of exposed insulator that could be seen by the collecting plates and eliminated distortion of the electric field by the insulators. The horizontal guard strips were kept fixed in position. The vertical guard strips were movable so that the dis-

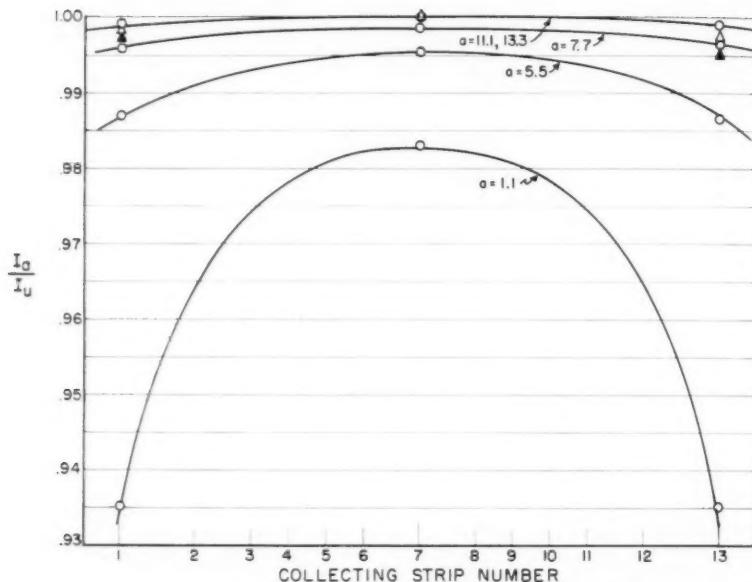


Fig. 5. Field distortion across a collecting plate 11.8 cm. wide.  $I_a$  is the ionization measured for a particular value of  $a = D/S$ .  $I_u$  is the ionization measured when the field is undistorted.  $\circ$  data of this experiment at 50 kv with inherent filtration and 100 kv with 4 mm. aluminum filtration.  $\blacktriangle$  data of Roth (7) at 50 kv, 0.24 mm. Al h.v.l.  $\triangle$  data of Roth at 200 kv, 0.56 mm. Cu h.v.l.

tance between them and the collecting plates could be varied to investigate field distortion.

The ionization distribution of the scattered photon contribution was obtained with the aid of a polystyrene tube, 2 cm. inside diameter, 0.22 mm. thick. This wall thickness was greater than the maximum electron range so that ionization from electrons generated by the primary x-rays could not be produced outside of the tube. The tube was made conducting with a coating of colloidal graphite. Scribed lines through the graphite along the length of the tube insulated portions of it from each other and permitted them to be electrically connected to the guard strips so as to reduce the field distortion caused by the tube itself (8).

#### FIELD DISTORTION

A section through the experimental free-air chamber, viewed from above, is shown in Figure 4. The thirteen collecting plates

were used to study the ionization at different points along the x-ray beam. The change in ionization for different guard-strip configurations was a measure of the change of field distortion caused by the guard strips. The method used was similar to that described earlier by Failla (5). In general, field distortion can be caused by the grounded lead box and by the guard strips themselves. The guard-strip system used in this experiment completely shielded the collecting region from the box. No change in the ionization current was measurable when the potential of the box was changed from ground to that of the high-voltage plate. The distortion studied was thus due only to the guard strips themselves. Two sets of guard strips were used: one with  $S$ , the centerline-to-centerline spacing of the strips, equal to 0.9 cm. and a strip thickness of 0.16 cm.; the other with  $S$  equal to 0.45 cm. and a strip thickness of 0.08 cm. The distance between the guard strips and the collecting or high-voltage

plates was  $S/2$  for the strips closest to the plates. The potential across these strips was half that applied to the strips with spacing  $S$ .  $W$  was kept fixed at 1.6 cm.  $D$ , the distance between the edge of the collector and the guard strips, was varied from 1 to 12 cm. The distance between the high-voltage and collecting plates was 12.5 cm. There were 10-cm.-wide guard plates above and below the collectors and 14-cm.-wide guard plates at the front and back of the chamber.

Figure 5 shows the results of the field distortion study. The distortion was found to depend on  $a = D/S$ .  $I_a$  is the ionization measured for a particular value of  $a$ .  $I_u$ , the ionization measured when the field is undistorted, was determined by removing the guard-strip assembly and averaging the ionization measured with the lead box at ground potential and at the potential of the high-voltage plate. The average corresponds to a measurement made with a field undistorted by the box (2). A ratio of  $I_a/I_u$  equal to 1 in Figure 5 indicates an undistorted field. This ratio is plotted as a function of the collecting strip number.

Since the total width of collecting strips 1 to 13 was 11.8 cm., Figure 5 represents the field distortion at different points across an 11.8-cm.-wide collector. This figure can be used to average the distortion and obtain ratios of  $I_a/I_u$  across an 11.8-cm. collector of 0.966, 0.992, 0.998, and 1.00 for values of  $a$  equal to 1.1, 5.5, 7.7, and 11.1 (or greater) respectively. The distortion across collecting plate assemblies that are not 11.8 cm. wide cannot be estimated from Figure 5. A collecting plate assembly consisting of several collectors whose combined width was 11.8 cm. could be designed. A narrow collector at the front of the assembly could be used to measure the low-energy, inherent-filtration x-rays, while the wider collectors could measure the high-energy, heavily filtered x-rays. Figure 5 can be used to estimate the distortion for narrow collecting strips if their width is approximately the same as those used in this experiment. For exam-

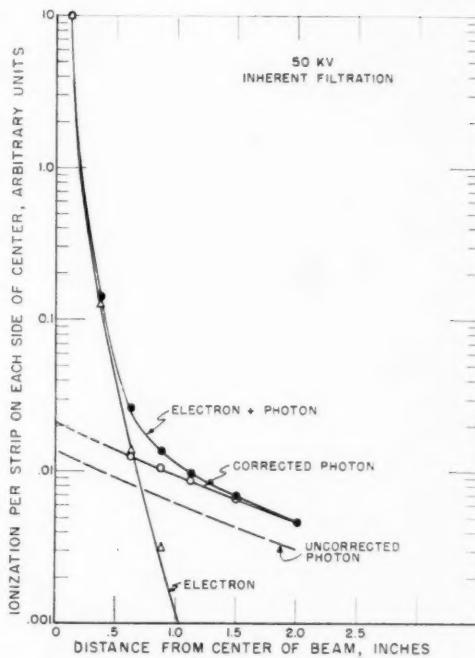


Fig. 6. Method of determining primary electron and photon contributions. ● Electron + photon contribution (tube out). ○ Photon contribution (tube in). △ Primary electron contribution (by subtraction).

ple, a 1.3-cm.-wide collector at the end of the collecting plate assembly would have ratios of  $I_a/I_u$  equal to 0.999 and 0.996 for  $a$  equal to 11.1 and 7.7.

Data supplied by Roth (6) for a similar experiment, in which  $a$  equalled 11, are also shown in Figure 5. Roth found that the field distortion depended upon the energy of the x-ray beam used in the experiment. This effect may have been due to distortion caused by the exit hole for the beam that was cut in the guard-strip system. One would expect exit-hole distortion to be smaller at higher energies since a smaller fraction of the total ionization takes place near the center of the beam. Roth's data at 200 kv are in good agreement with the present experiment, which was done at 50 kv with inherent filtration, and at 100 kv with 4-mm. aluminum filtration. No energy dependence of field distortion was found in this experi-

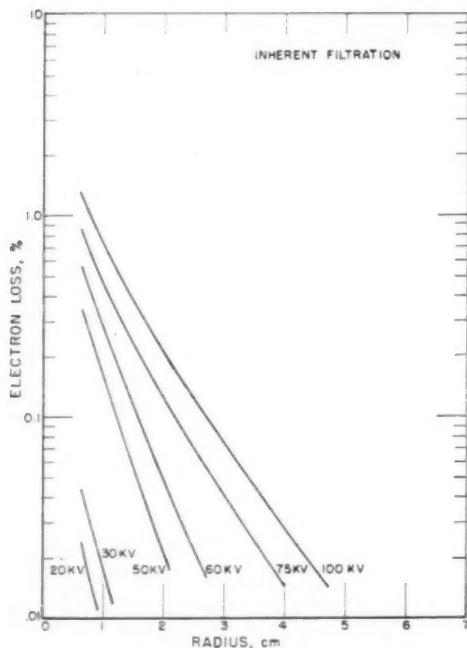


Fig. 7. Loss of electron-produced ionization (in percentage of total electron ionization) beyond different radii from a zero-diameter beam of constant potential x-rays. The filtration was 2 mm. of beryllium (inherent) + 1 meter of air.

Fig. 8. Loss of electron-produced ionization (in percentage of total electron ionization) beyond different radii from a zero-diameter beam of constant potential x-rays. The total filtration was the inherent filtration + 0.5 mm. aluminum added filter + 1 meter of air.

ment, indicating that the exit hole (1.8 cm. square) in the guard-strip system had no effect upon the distortion. This indicates that fairly large holes may be cut in the guard strips without serious distortion. In general, however, the size of the entrance and exit holes should be minimized, though they must be large enough to permit the x-ray beam to pass through the guard strips without striking them.

The primary objective of the field-distortion study was to devise a guard-strip system that minimized the distance from the diaphragm to the collector and caused negligible (<0.1 per cent) field distortion. No attempt was made to vary the height of the vertical guard strips because the chamber could be oversized in the vertical direction without a prohibitive increase in weight. A qualitative discussion of the effect of varying the height of the chamber can be given. The distortion increases

most rapidly at the top and bottom of the collector as the height of the vertical guard strips is decreased. The effect of this distortion on the total ionization measured by the chamber is decreased by the fact that the ionization density is usually small at the top and bottom of the collector. The horizontal guard strips at the top and bottom of the chamber may also interact to change the field distortion caused by the vertical guard strips, but this type of distortion should be slight (2). The heights of Roth's vertical guard strips and those in the present study were 35 and 28.5 cm., respectively. The close agreement between the two experiments indicates that the field distortion is relatively insensitive to changes in the height of the free-air chamber if the height is large. The field distortion might also depend upon the thickness of the guard strips. A check was

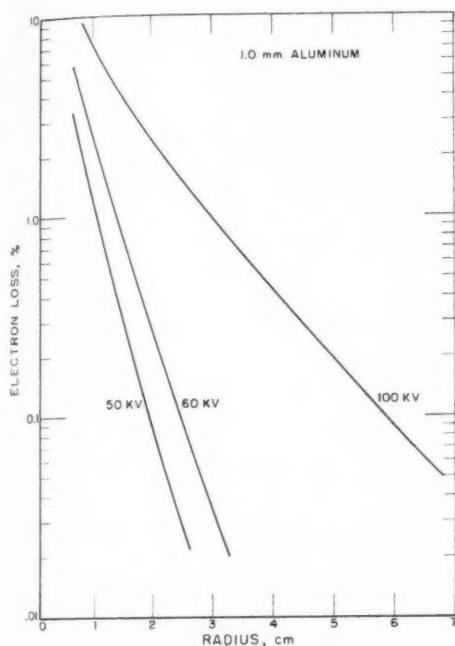
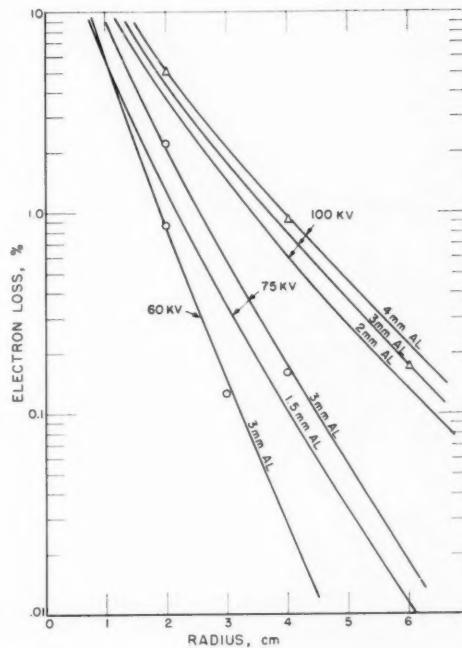


Fig. 9. Loss of electron-produced ionization (in percentage of total electron ionization) beyond different radii from a zero-diameter beam of constant potential x-rays. The total filtration was the inherent filtration + 1.0 mm. aluminum added filter + 1 meter of air.

Fig. 10. Loss of electron-produced ionization (in percentage of total electron ionization) beyond different radii from a zero-diameter beam of constant potential X-rays.  $\circ$  Data of Attix and DeLaVergne at 60 kv, 3 mm. Al filtration and 75 kv, 3 mm. Al filtration.  $\triangle$  Data of Attix and DeLaVergne at 100 kv, 4 mm. Al filtration.

made with  $S = 0.9$  cm. and  $D = 5$  cm. by varying the thickness of the strips from 0.16 cm. to 0.9 cm.<sup>2</sup> No change in the field distortion was observed.

Gross distortions of the electric field can occur if exposed insulators are present in the free-air chamber. In one instance the ionization changed by 25 per cent when an exposed insulator was removed. The exposed insulator surface was minimized in the present experiment and the effect of the insulators separating the guard strips was checked by placing a dummy insulator in the chamber. Small distortions of the



field can occur if the resistors in the voltage-dividing network for the guard strips are not matched properly. Measurements indicate, however, that this effect is negligible if the resistors are matched to  $\pm 5$  per cent.

The data taken in the course of the field-distortion study yielded information about the uncertainty in determining the collecting volume of the free-air chamber. The ionization per length of collector was measured under conditions of negligible field distortion from the guard strips and corrected for air attenuation. If the collecting volume was undistorted and if the length of the strip has been measured with sufficient accuracy, each strip should then measure the same ionization/length. Actually, the ionization/length determined experimentally for each strip was found to be within  $\pm 0.2$  per cent of the average. Thus the maximum uncertainty in the collecting volume due to field distortion

<sup>2</sup> A new low-energy (20-100 kv) free-air chamber with guard strips 14 cm. high has been intercompared with the NBS medium-energy (60-250 kv) standard which has guard strips of 27 cm. height. The agreement between the two systems (different capacitors, diaphragms, potentiometers, etc.) was well within the  $\pm 0.5$  per cent expected for such an intercomparison (2). This indicates that no gross distortions of the electric field occur when the guard-strip height is reduced to 14 cm. A description of the new low-energy standard and a discussion of the intercomparison will be published shortly.

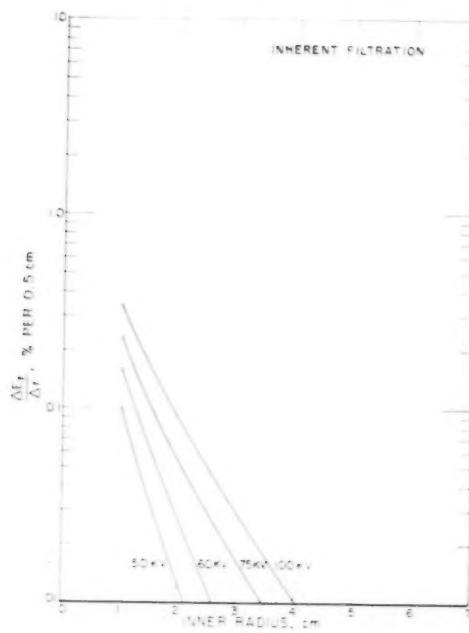
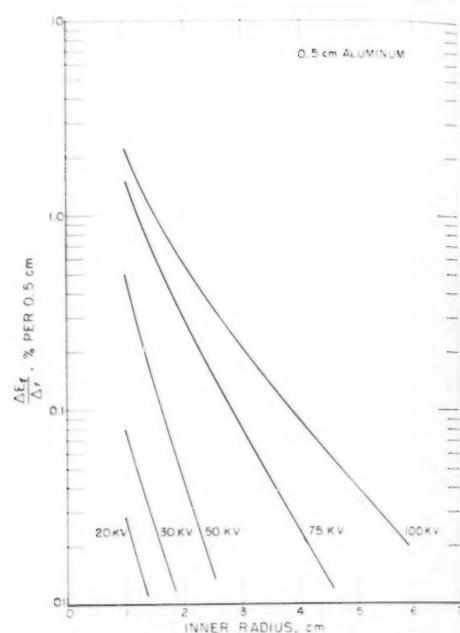


Fig. 11. Loss of electron-produced ionization per 0.5 cm. radius increment for the x-rays of Fig. 7.  
 Fig. 12. Loss of electron-produced ionization per 0.5 cm. radius increment for the x-rays of Fig. 8.

caused by the collectors themselves and to difficulties in measuring the length of the collector (6 mm. in this experiment) is about  $\pm 0.2$  per cent.

To summarize, certain points are to be borne in mind in the design of a free-air chamber with minimal field distortion. Distortion caused by the lead box can be estimated from *Handbook 64*, while Figure 5 can be used to determine the distortion caused by the guard-strip system. This distortion will be independent of the thickness of the guard strips and relatively insensitive to changes in the height of the guard strips. Distortion caused by lack of planarity of the collector and its guards will be negligible if the collector and guards are machined flat, to about 0.0025 mm. per centimeter of collecting plate width (2). The size of the entrance and exit holes cut in the guard-strip system for the x-ray beam should be as small as possible. The amount of exposed insulating material in the chamber must be minimized, and the effect of any remaining exposed insulator should be determined.



#### ELECTRON AND SCATTERED PHOTON CORRECTIONS

Figure 2 shows a side view of the arrangement used to determine the electron distributions and the scattered photon contributions. The experimental procedure was similar to that used by previous workers (7, 8). The collecting plates were turned so that their long axes were parallel to the x-ray beam. The ionization was first sampled by the different collectors, with the plastic tube in the chamber. The tube was aligned coaxially with the beam. The ionization measured with the tube in place was due only to the scattered photons. The tube was then removed. The ionization measured under the second condition was the sum of the primary electron and scattered photon contributions. The primary electron distribution could then be determined by subtracting the photon contribution measured previously. A typical example is shown in Figure 6. The photon curve was corrected for attenuation in the walls of the tube and for the non-air

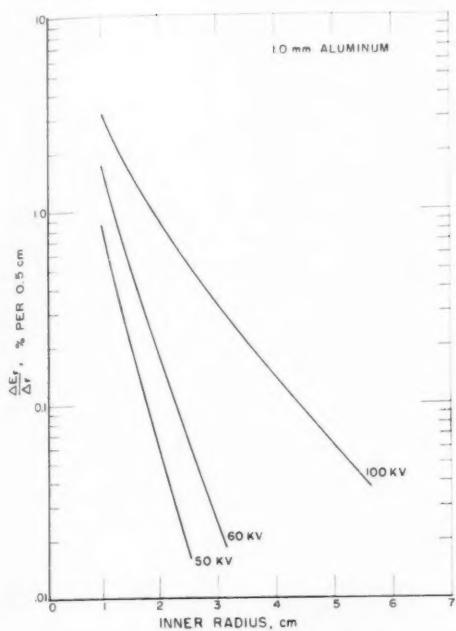
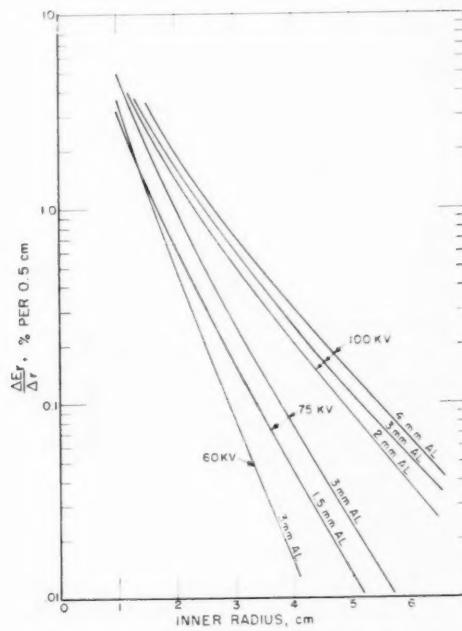


Fig. 13. Loss of electron-produced ionization per 0.5 cm. radius increment for the x-rays of Fig. 9.  
Fig. 14. Loss of electron-produced ionization per 0.5 cm. radius increment for the x-rays of Fig. 10.



equivalence of the plastic substance by raising it until it coincided with the electron-plus-photon curve at large distances from the beam, where the primary electron contribution was negligible. The primary electron contribution was not negligible for the highest energy x-ray beams used in this experiment. For these cases the non-air equivalence was estimated from the data of Attix and DeLaVergne (7).

The presence of the tube tended to distort the electric field near the center of the chamber. This distortion would produce an appreciable error in the slope of the photon curve. The magnitude of this distortion was determined by irradiating the entire chamber uniformly from one side with  $Cs^{137}$  gamma rays.<sup>3</sup> The ionization was sampled with the tube in place and found to be uniform to  $\pm 1$  per cent over all but the center three collecting strips. The photon curve was therefore extrapolated in this central region.

<sup>3</sup> This method of checking the field distortion was suggested by H. O. Wyckoff.

Figures 7-10 show the percentage of electron loss outside of a given radius from the x-ray beam. The results are computed in cylindrical co-ordinates (7) for a zero-diameter beam (8) (air at  $26^\circ$  C. and 760 mm. Hg). Figures 11-14 show the electron contribution per radius increment,  $\Delta E/\Delta r$ , at different inner radii. Agreement with the work of Attix and DeLaVergne is seen to be excellent. Figures 7-14 can be used to determine the electron loss in any particular free-air chamber. These curves assume that the electrons striking the plate system are absorbed. The back-scatter of electrons from aluminum is at least 20 per cent in this energy region (9). Thus, in designing a chamber, the electron loss should be kept smaller than 1 per cent if the error due to back-scatter is to be kept to a few tenths of 1 per cent.

Figure 15 shows the variation of the scattered photon contribution with radius. The curve has been arbitrarily normalized to 1 at the greatest radius used in this experiment. The shape of the curve was

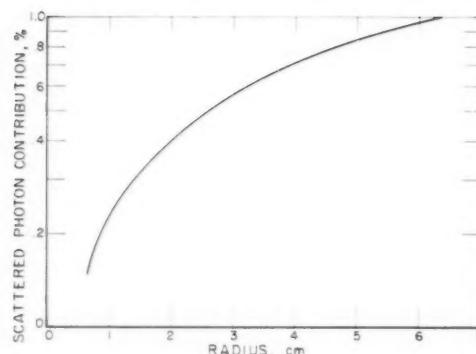


Fig. 15. Contribution of secondary photon ionization within different radii from a zero-diameter x-ray beam. Multiply the ordinate by the factors in Table I to obtain the contribution in per cent of the total primary electron ionization for the various kilovoltages and filtrations.

TABLE I: MULTIPLIERS FOR ORDINATE OF FIGURE 15

Kv <sub>ep</sub>	Inherent Filtration	0.5 mm. Al	1 mm. Al	1.5 mm. Al	2 mm. Al	3 mm. Al	4 mm. Al
20	0.9	0.9	...	...	...	...	...
30	0.9	0.75	...	...	...	...	...
50	0.9	0.7	0.6	...	...	...	...
60	0.9	...	0.6	...	...	0.55	...
75	0.9	0.6	...	0.55	...	0.5	...
100	0.9	0.5	0.5	...	0.5	0.5	0.4

found to be independent of the energy of the x-ray beam. The magnitude of the photon contribution varied with the kilovoltage and filtration used. The ordinate of Figure 15 must be multiplied by the multipliers in Table I to obtain the photon contribution within a given radius for a zero-diameter beam in per cent of the total electron contribution. Table II compares these results with the work of Attix and DeLaVergne for the higher kilovoltages and heavier filtrations. Their work involved an extrapolation of the scattered photon curve in the region where the radius was less than 5 cm. The present experiment, which measured the slope in this region, indicates that the extrapolation underestimated the scattered photon correction by about 0.07 per cent. The two experiments agree to 0.1 or 0.2 per cent when this correction is applied to their results.

The present experiment was done with about 1 meter of air between the x-ray

tube and the collecting region. Longer air paths would selectively filter the lower energy components of the x-ray beam, thereby increasing its effective energy. The effect of longer air paths on the electron and photon contributions was determined for 20 kv x-rays with inherent filtration and found to be negligible. The zero-beam diameter approximation was checked experimentally with 20 kv x-rays (inherent filtration) for 0.5 and 1.0 cm. diameter beams and found to be valid.

#### AIR ATTENUATION AND OTHER FACTORS

The field distortion study previously described makes possible design of a free-air chamber with a 5-cm. air path between

TABLE II: COMPARISON WITH WORK OF ATTIX AND DELAVERGNE

Energy	Photon Contribution Within 5 cm. Radius, in Per Cent		
	Present Experiment	Attix	Attix, Corrected
100 kv <sub>ep</sub> , 4 mm. Al	0.32	0.13	0.20
75 kv <sub>ep</sub> , 3 mm. Al	0.41	0.14	0.21
60 kv <sub>ep</sub> , 3 mm. Al	0.44	0.14	0.21

the chamber diaphragm and the center of the collector. If there is at least 1 meter of air plus 0.5 mm. of aluminum between the x-ray target and the free-air chamber, the air attenuation data of Day and Taylor (10) can be used with only small errors. A redetermination of the air attenuation corrections yielded corrections for a 5-cm. air path 0.15 per cent higher than the values given by those workers. For inherent filtration the difference was 0.2 per cent or less from 100 kv down to 50 kv; about 0.3 per cent at 30 kv. The differences imply a higher inherent filtration for the x-ray tube used by Day and Taylor.

TABLE III: HALF-VALUE LAYERS IN MM. OF ALUMINUM

Kvcp	Inherent Filtration	0.5 mm. Al Filtration	1 mm. Al Filtration	1.5 mm. Al Filtration	2 mm. Al Filtration	3 mm. Al Filtration	4 mm. Al Filtration
20	0.07 (0.08)*	0.24 (0.25)	...	...	...	...	...
30	0.08 (0.10)	0.36 (0.40)	...	...	...	...	...
50	0.09 (0.10)	0.50 (0.58)	0.88 (1.1)	...	...	...	...
60	0.09	...	1.1	...	...	2.1	...
75	0.09	0.66	...	1.6	...	2.5	...
100	0.09 (0.11)	0.77 (2.1)	1.4	...	2.5	3.5	3.9

\* The values obtained by Day and Taylor are given in parentheses.

Tungsten from the filament may have evaporated onto the beryllium window, increasing the inherent filtration. This, in turn, would decrease the air-attenuation corrections and increase the half-value layers that would be measured. The half-value layers measured by Day and Taylor are indeed larger than those that were measured in the present experiment (Table III). The air attenuation should be measured in each laboratory at the lower kilovoltages and filtrations if the highest accuracy is to be attained.

The roentgen is defined for a mass of *dry* air. Corrections for the humidity of the air may amount to +0.3 per cent in the soft x-ray region under ordinary laboratory conditions. Methods of calculating this correction are found in *Handbook 64*.

#### SUMMARY

The general requirements for the design of standard free-air ionization chambers have been summarized in National Bureau of Standards *Handbook 64*. The present experiment has determined supplementary criteria for the soft x-ray region. The maximum uncertainties in the factors investigated here may be summarized as follows: field distortion and errors in measuring the length of the collector  $\pm 0.2$  per cent, electron losses  $\pm 0.1$  per cent, scattered photon contribution  $\pm 0.2$  per cent and air attenuation  $\pm 0.2$  per cent. These values, combined with the estimates in *Handbook 64* for uncertainties in the

diaphragm area, charge measurement, etc., yield a probable limit of error of  $\pm 0.5$  per cent for the determination of exposure dose in roentgens in the soft x-ray region.

NOTE: The author expresses his gratitude to H. O. Wyckoff, F. H. Attix, S. W. Smith, and M. G. Ehrlich for many helpful discussions in the course of the experiment.

National Bureau of Standards  
Washington 25, D. C.

#### REFERENCES

- Report of the International Commission on Radiological Units and Measurements. National Bureau of Standards Handbook 62. Washington, D. C., Superintendent of Documents, Govern. Print. Off., 1956.
- WYCKOFF, H. O., AND ATTIX, F. H.: Design of Free-Air Ionization Chambers. National Bureau of Standards Handbook 64. Washington, D. C., Superintendent of Documents, Govern. Print. Off., 1957.
- THORAEUS, R., ET AL.: Vergleichsmessungen des internationalen "Röntgen" im Bereich von 8 kV bis 170 kV Erzeugungsspannung. Strahlentherapie **98**: 265-270, 1955.
- BUNDE, E., SEWKOR, A., RAJEWSKY, B., AND JAEGER, R.: Verifizierung des "r" bei Röntgenstrahlen im Bereich 5 kV bis 50 kV Erzeugungsspannung. Acta radiol. **44**: 163-183, August 1955.
- FAILLA, G.: Criteria for the Design of a Standard Ionization Chamber. Am. J. Roentgenol. **21**: 47-63, January 1929.
- ROTH, E.: New Zealand Dept. of Health, Christchurch, N. Z. Personal communication.
- ATTIX, F. H., AND DELAVERGNE, L.: Plate Separation Requirements for Standard Free-Air Ionization Chambers. Radiology **63**: 853-865, December 1954. J. Research NBS **53**: 393, 1954.
- WYCKOFF, H. O., AND KIRN, F. S.: Standard Chamber Requirements for 250 to 500-Kilovolt X-Rays. J. Research NBS **58**: 111, 1957.
- BORTNER, T. E., AND RICHARDS, H. K.: Ionization Chamber Measurement of Backscatter and Absorption of Beta Particles. Oak Ridge National Lab. Report CF 55-8-104, Sept. 1, 1955.
- DAY, F. H., AND TAYLOR, L. S.: Absorption of X-Rays in Air. Radiology **52**: 239-247, February 1949.

(*Pro le sumario in interlingua, vider le pagina sequente*)

## SUMMARIO IN INTERLINGUA

## Construction de Cameras de Ionisation a Aere Libere pro le Region de Radios X Molle (20 a 100 kv)

Criterios de construction esseva determinate pro cameras standard de ionisation a aere libere pro le region del molle radios X. Un tubo Roentgen a pecia de concentration de wolfram e un fenestra de beryllium de 2 mm esseva utilitate con potentiales excitatori de inter 20 e 100 kvcp. Usque a 4 mm de aluminium esseva addite al filtration inherent del tubo.

Le distortion del campo electric al electrodo colligente, causate per le proximitate del sistema de bandas de guarda, esseva studiate como function del distantia inter le bandas e le electrodo colligente,

del distantia centro-a-centro inter le bandas, e del spissitate del bandas.

Le distribution radial del primari ionisation electronic e del dispergite ionisation que es photonicamente inducite esseva mesurate. Le accordo con le investigationes de Attix e DeLaVergne es bon. Es discutite altere factores corrective que es de importantia particular in le region de radios X molle. Le datos indica que le mesuration del dosage de exposition in roentgens pote esser facile in iste region de energia con un probabile margine de error de  $\pm 0,5$  pro cento.



# Use of Magnetic Tape for Recording Radioactivity<sup>1</sup>

SOLOMON N. ALBERT, M.D., H. N. ECCLESTON, JR., M.D., T. FUJITA, M.D.,  
CHARLES H. HUNTER, M.D., and CHALOM A. ALBERT, M.D.

**R**ADIOACTIVE ISOTOPES are frequently used as tracer material for diagnostic purposes. The principle employed for determining rate of blood flow is based on a dilution or elimination rate of the administered tracer dose. Activity rate is measured with a suitable detector and recording system.

## METHOD

A suitable detector probe is activated to the proper voltage level by an appropriate power supply source, either from a scaler or rate-meter unit. The output from the scaler or rate meter is directly attached to the microphone input of the tape recorder. The simultaneous use of tape recording

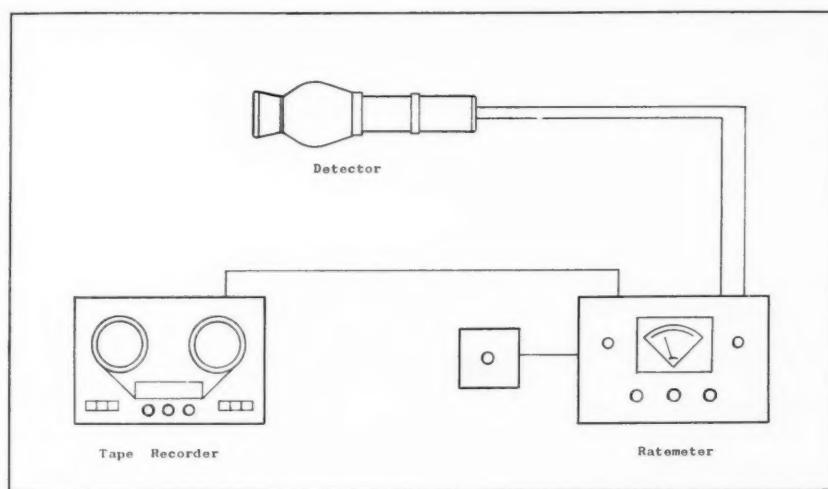


Fig. 1. Scheme for tape recording radioactivity by tapping speaker output of ratemeter.

Interpretation of disappearance curves is at times rendered difficult because of a weak dose of radioactive material introduced into the system or inadequate settings of the rate meter as to scaling and time factors.

To obviate loss of valuable data, a recording system that could register all impulses emitted by the detector probe would be of value. These could then be reproduced at leisure through a scaler or integrating rate meter. Commercial tape recorders have proved adaptable for registering radioactive disintegration impulses.

does not interfere with the routine recording system obtained directly from a rate meter or while the counting of radioactivity is in progress.

## RATE METER

1. *Nuclear-Chicago Rate Meter, Labitron, or Survey Meter.* The speaker leads, or phone plugs, are tapped and connected directly to the microphone input of the tape recorder (Fig. 1).

2. *Picker Rate Meter.* The amplifier output, contact point 8 on the J4 amplifier plug in the socket, is tapped and connected

<sup>1</sup> From the Anesthesiology Research Laboratory and Radioisotope Laboratory, District of Columbia General Hospital, Washington, D. C. Project supported in part by Atomic Energy Commission Contracts AT (30-1) 1820 and AT (30-1) 2277 with George Washington University, Washington, D. C.

Accepted for publication in February 1959.

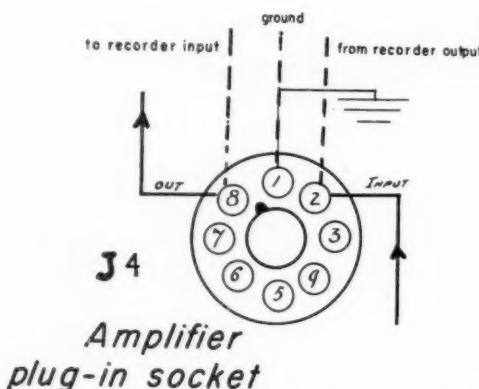


Fig. 2. Scheme of J4 plug in socket and points at which connections are made to and from the tape recorder.

Phillips tape recorder offers wider flexibility in recording and for replay. Normally a 3 3/4 inch per second tape recording is adequate.

#### REPLAY OF TAPE RECORDING

Tape recordings can be replayed by simply connecting the tape recorder output to the input of the rate meter. For counting purposes, it may be connected to the input of a scaler.

1. *Nuclear-Chicago Rate Meter* (Model #1620): A small Fisher transistor preamplifier is employed. The tape recorder speaker output is connected to the pre-

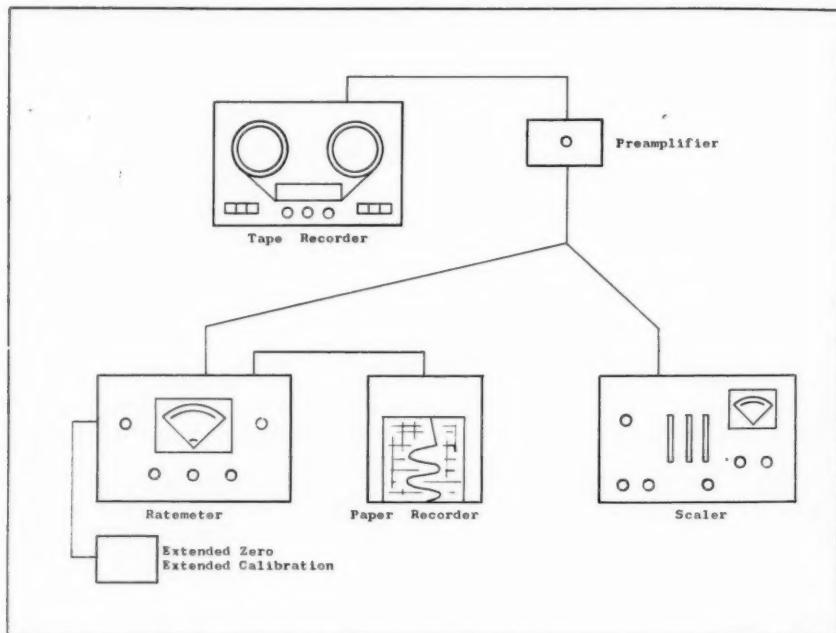


Fig. 3. Reproduction of tape recording of radioactivity through a pre-amplifier to the input of a scaler for absolute counting or through a rate meter for chart recording.

to the microphone input of the tape recorder.

Settings of the rate meter, sensitivity, and scaling rate are immaterial for magnetic tape recording purposes (Fig. 2).

#### TAPE SPEED FOR RECORDING

Tape speed for recording is dependent on activity rate. A three-speed Norelco

amplifier input and the preamplifier output to the scaler or rate-meter input (Fig. 3).

2. *Nuclear-Chicago Labitron* (Model #1619A): No preamplifier is necessary. The recorder output is directly connected to the input.

3. *Picker Counting Rate Meter* (Model #2805): Tape recorder output is attached

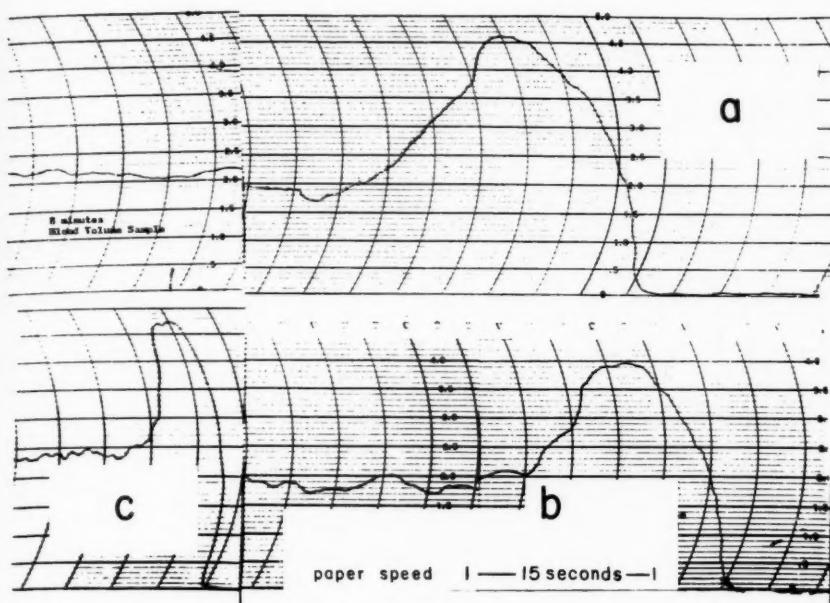


Fig. 4. Reproduction of three cardiac output dilution curves from tape recordings. a. Control. Dosage 10 mmc Cr<sup>51</sup>. Blood volume 3,005. Cardiac output 3,900. b. Adrenalin infusion. Dosage 10 mmc Cr<sup>51</sup>. Blood volume 3,320. Cardiac output 6,630. c. Hypothermia. Dosage 10 mmc Cr<sup>51</sup>. Blood volume 2,530. Cardiac output 6,325.

directly to the rate-meter preamplifier input; contact point 2 on the J4 amplifier plug in socket.

The count rate can be doubled or halved depending on the tape speed at which the recording is replayed. With a replay speed twice the recording speed, counts are doubled and counting time is halved. This permits reproduction of low-activity curves and converts a poor dilution or elimination curve into one which can be easily interpreted (Fig. 4).

In order to obtain rapid and minor changes in activity rate clearly, a reduced replay speed may be employed.

#### PHONO TRIX TAPE RECORDER

This tape recorder operates on 4 flash-

light batteries. It does not function on preset fixed speeds but has a variable speed control of 1 to 8 inches per second, and a wider flexibility. In order to standardize the speed limit, a 60-cycle feed is recorded for a 30-second period as a control. By varying the replay speed, the height of the curve and duration are compared to the 60-cycle standard.

#### SUMMARY

A simple adaptation of magnetic tape recorders to rate meters or scalers has been devised. This can be used for registering impulses from detectors in order to record and measure radioactivity.

Department of Anesthesiology  
Washington Hospital Center  
Washington 10, D.C.

*(Pro le sumario in interlingua, vider le pagina sequente)*

## SUMMARIO IN INTERLINGUA

## Le Uso de Bandas Magnetic in le Registration de Radioactivitate

Le uso de isotopos radioactive como traciatores pro objectivos diagnostic es basate super le tempo de dilution o elimination del dose administrate. Le interpretation del curvas de dilution o elimination, tamen, es frequentemente difficile a causa del debilitate del dose de materia radioactive o a causa de inadequate dispositivos de lectura in le mesurator de intensitate con respecto a factores de scalation e tempore. Un sistema de registration pareva desirabile que registrarea omne le impulsos transmittite per le detector e permitterea lor reproduction calmemente per un scalator o ratiometro integrational. Le autores describe un simple adaptation de registratores a banda magnetic pro iste objectivo.



# EDITORIAL

## Radiation Control at the Grassroots

The first place that most of us have looked to see if radiation exposures can be reduced has been in our own radiological offices and departments. Protection, like charity, properly starts at home, and self-inspection and re-evaluation of our own technics have been a worthwhile activity. By now, such efforts in radiation control have been sufficiently emphasized that our equipment and procedures should have been brought up to modern acceptable standards. But is this enough? Is the radiologist's responsibility completed at this point? As part of the small group with pertinent specialist education and comprehensive understanding of radiation problems, we can offer our talents at least to our community and regional situation. As civic-minded citizens we shall find here a real opportunity for service which no one else can provide.

The need is apparent. Elsewhere in this issue of *RADIOLOGY* is a report of a community survey of radiation exposure from medical fluoroscopes. Fluoroscopes were chosen for this investigation because they contribute a major proportion to both somatic and gonadal radiation exposure of the population. In this study of 81 fluoroscopes in the Philadelphia area, the findings show that both apparatus and technics are frequently not up to acceptable or desirable levels. Only about half of the fluoroscopes were producing exposure dose rates considered acceptably low. Less than one out of ten machines met more critical performance standards.

The apparatus of radiologists and that found in hospitals was generally better than the apparatus of non-radiologists, but need for some improvement was apparent in all groups. More remarkable, however, was the finding that 90 per cent

of these fluoroscopes could be brought up to acceptable standards by relatively minor and inexpensive modifications.

The medical action taken in this community was voluntary and self-generated. A Radiation Committee of the County Medical Society made arrangements with a commercial radiological safety group to provide comprehensive inspection and analysis of fluoroscopic apparatus for its members. A cost of approximately \$40 per machine includes a written report of the findings and recommendations, but does not include alterations unless they are so simple as to require no additional charge by the inspection physicist. More extensive alterations were considered to be the province of regular x-ray service organizations. To date about 100 members of the Philadelphia County Medical Society have availed themselves of this service. This appears to be a plan suitable for wide use and one which can be initiated by radiologists in their own localities.

The problems of medical radiation control involve much more, of course, than correcting deficiencies in apparatus alone. Considerably more important are the methods of use of the apparatus and the judgment involved in choice of procedures for individual patients. These can be improved only by educational methods which emphasize adequate dark adaptation before fluoroscopy, reduction in the time of fluoroscopic exposure as far as is consistent with obtaining the needed information, and limitation of fluoroscopy to situations where it is specifically needed. The emphasis on control of fluoroscopy seems justified because it is not so intrinsically self-limiting in exposure as are radiographic procedures, but the latter should not be neglected. The numerous papers

December 1969

which have appeared in our journals, the publications of the American College of Radiology, and its recently released movie furnish source material for such educational efforts. Here also, however, the personal attention of radiologists is needed to implement this effort across the country and at local levels.

If we grant that the need is obvious and that these two forms of action are appropriate, we as radiologists have much to gain in spearheading them. The opportunity for constructive leadership is ours as well as moral obligation to be of service in a field of special competence. It seems worth trying at *your* grassroots.

RICHARD H. CHAMBERLAIN, M.D.

## ANNOUNCEMENTS AND BOOK REVIEWS

### EAST TENNESSEE RADIOLOGICAL SOCIETY

At a recent meeting of the East Tennessee Radiological Society at Gatlinburg, Eugene Abercrombie, M.D., of Knoxville, assumed the Presidency. Elected to office were: Vice-President, James J. Range, M.D., Johnson City; President-Elect, John M. Higgason, M.D., Chattanooga; Secretary-Treasurer, J. Marsh Frere, Jr., M.D., 205 Medical Arts Building, Knoxville.

### FLORIDA WEST COAST RADIOLOGICAL SOCIETY

Newly elected officers of the Florida West Coast Radiological Society are: Charles M. Gray, M.D., Tampa, President; James Shelden, M.D., Lakeland, Vice-President; Joseph C. Rush, M.D., Mease Hospital, Dunedin, Secretary-Treasurer. The Society meets quarterly at the Tampa Terrace Hotel.

### NEBRASKA RADIOLOGICAL SOCIETY

At a recent meeting of the Nebraska Radiological Society the following officers were elected: President, Shaun Gunderson, M.D., Omaha; President-Elect, Warren Bradley, M.D., Lincoln; Secretary-Treasurer, Ronald E. Waggener, M.D., Nebraska Methodist Hospital, Omaha.

### ISOTOPE COURSE QUEENS HOSPITAL CENTER, NEW YORK

A four-month course in the Medical Uses of Radioactive Isotopes is being offered at the Queens Hospital Center, Department of Hospitals, City of New York, by the Radiation Medicine Department, beginning Feb. 9, 1960. Weekly five-hour sessions will include lectures, laboratory exercises, and clinical management of patients. Tuition is \$275.00.

Requests for further information should be sent to Dr. Philip J. Kahan, Supervising Medical Superintendent, Queens Hospital Center, 82-68 164th St., Jamaica 32, N. Y.

### POSTGRADUATE COURSE IN RADIOLOGY UNIVERSITY OF KANSAS

The annual postgraduate meeting in Radiology at the University of Kansas Medical Center will be held Feb. 8-10, 1960. Further information may be obtained from G. M. Tice, M.D., University of Kansas Medical Center, Kansas City 12, Kans.

### LOS ANGELES RADIOLOGICAL SOCIETY MIDWINTER CONFERENCE

The Twelfth Annual Midwinter Radiological

Conference, sponsored by the Los Angeles Radiological Society, will be held at the Statler Hotel, Los Angeles, on Saturday and Sunday, Jan. 30-31, 1960.

An outstanding program has been arranged. Guest speakers will be Dr. John A. Evans, New York; Professor Knut Lindblom, Stockholm, Sweden; Dr. James J. Nickson, New York; Dr. E. Rohan Williams, London, England.

The Conference fee of \$20.00 includes two luncheon meetings featuring questions and answers. A banquet (\$7.50 per plate) preceded by cocktails will be held Saturday evening. Reservations may be made through Dr. Sidney D. Zucherman, 3741 Stocker St., Los Angeles 8, Calif. Hotel reservations should be made promptly through the Convention Manager, Statler Hotel, Los Angeles, Calif.

### CARDIOVASCULAR ROENTGENOLOGY FELLOWSHIP

A Fellowship in Cardiovascular Roentgenology will be open Jan. 1, 1960, in the Department of Radiology at the University of California in Los Angeles. In support of this, the National Institutes of Health are providing \$12,000. The purpose is to acquaint young radiologists with the nature of academic radiology, particularly in the fields of cardiovascular teaching and research. Candidates should have completed or approximately completed their residency requirements in Radiology or Diagnostic Radiology and preferably should be eligible for their Board examinations.

### In Memoriam

AMOS R. SHIRLEY, M.D.  
1887-1959

Dr. Amos Shirley, retired Chief of X-ray Services for the Veterans Administration regional office, Milwaukee, died recently of a heart ailment.

Dr. Shirley was born in Coventry, England, in 1887. He received his medical education at Columbia University, New York, and the University of Vermont. Thirty-seven years of his life were spent in Federal service. Prior to joining the regional office of the Veterans Administration in Milwaukee in 1946, he was for eleven years Chief of Radiology at the VA Center at Wood, Wisc.

Dr. Shirley was a member of the Radiological Society of North America, the Milwaukee Roentgen Ray Society, and a service fellow in the American Medical Association. He was past state commander of the Military Order of World Wars and of its Milwaukee chapter. He was a lieutenant colonel in the army in World War II and held a post with the war risk insurance bureau.

Surviving are his wife, Harriet, a daughter, Mrs. Ruth Harmon, Vero Beach, Fla., and a son, Amos, Jr., Milwaukee.

## Books Received

Books received are acknowledged under this heading, and such notice may be regarded as recognition of the courtesy of the sender. Reviews will be published in the interest of our readers and as space permits.

**ATLAS OF ROENTGENOGRAPHIC POSITIONS.** By VINITA MERRILL, while Educational Director, Picker X-ray Corporation. A two-volume work of 674 pages, with numerous illustrations. Published by The C. V. Mosby Company, St. Louis, 2d ed., 1959. Price \$32.50.

**BIOPHYSICAL SCIENCE—A STUDY PROGRAM.** Planned and edited by J. L. ONCLFY, Editor-in-Chief, F. O. SCHMITT, R. C. WILLIAMS, M. D. ROSENBERG, and R. H. BOLT, for the Biophysics and Biophysical Chemistry Study Section of the National Institutes of Health, Public Health Service, U. S. Department of Health, Education, and Welfare. A volume of 610 pages, with numerous figures and tables. Published in the *Reviews of Modern Physics*, January and April, 1959, and by John Wiley & Sons, Inc., New York, N. Y., 1959. Price \$6.50.

**L'ÉPAULE EN PRATIQUE RHUMATOLOGIQUE.** By S. DE SÈZE, A. RYCKEWAERT, AND M. MAITRE. Travail du Centre de rhumatologie Vigg-Petersen de l'Hôpital Lariboisière (Paris). A monograph of 170 pages, with 208 figures. Published by Masson & Cie, 120, Blvd. Saint-Germain, Paris, VI<sup>e</sup>, France, 1959. Price 3,800 fr.

**RADIOGRAPHIE DU CRÂNE ET DE LA FACE DANS LA MALADIE OSSEUSE DE PAGET.** By J.-A. LIÈVRE, Médecin des Hôpitaux de Paris, AND H. FISCHGOLD, Électroradiologue des Hôpitaux de Paris. Radio-diagnostic et radio-anatomie de précision. A volume of 132 pages, with 75 figures. Published by Masson & Cie, 120, Blvd. Saint-Germain, Paris, VI<sup>e</sup>, France, 1959. Price 4,000 fr.

**DETAILERKENNBARKEIT UND DOSIS BEI DER RÖNTGENDURCHLEUCHTUNG: DURCHLEUCHTUNGSSCHIRME UND BILDVERSTÄRKER.** By DR. MED. WOLFGANG FRIK, Privatdozent der medizinische Strahlenkunde, Röntgenabteilung der Medizinischen Klinik mit Poliklinik der Universität Erlangen. Band 6, Medizin: Theorie und Klinik in Einzeldarstellungen, edited by Professor Dr. med. Hans Schaefer, Heidelberg, unter Mitwirkung von Prof. Dr. G. Bodechtel, Munich, et al. A monograph of 168 pages, with 35 figures

and 48 tables. Published by Dr. Alfred Hüthig Verlag, Wilckensstrasse 3, Heidelberg, Germany, 1959. Price DM 18.—.

## Book Reviews

**AN ATLAS OF NORMAL RADIOGRAPHIC ANATOMY.** By ISADORE MESCHAN, M.A., M.D., Professor and Director, Department of Radiology, Bowman Gray School of Medicine of Wake Forest College, Winston-Salem, N. C.; Consultant, Walter Reed Army Medical Center, Washington, D.C.; Formerly Professor and Head of the Department of Radiology, University of Arkansas School of Medicine. With the assistance of R. M. F. FARRER-MESCHAN, M.B., B.S. (Melbourne, Australia), M.D., Research Associate, Department of Radiology, Bowman Gray School of Medicine of Wake Forest College, Winston-Salem, N. C. A volume of 760 pages, with 1,446 illustrations on 412 figures. Published by W. B. Saunders Co., Philadelphia, Penna., 2d ed., 1959. Price \$16.00.

The reception which this excellent work received when it first appeared in 1951 was such that subsequent editions to keep pace with expanding knowledge were inevitable. The text has now been revised and numerous additions have been made. A chapter on Radiation Protection has been included. The chapter on Bone Growth and Development has been rewritten, and the chapter on The Brain has been modified, with greater emphasis on angiography. Account has been taken of new developments in the study of the heart and great vessels, and advances in anatomic knowledge of the gastrointestinal tract, especially the physiology of swallowing, have been detailed. Other lesser changes have also been made.

Good judgment has been shown in the choice of illustrations. The reproductions, in the negative phase, are excellent. The line drawings are unusually well done and clearly labeled. A comprehensive index is added. Pertinent references are appended to each chapter.

This book can be recommended to the experienced radiologist as well as to the resident and student as an invaluable source of basic information.

**ATLAS OF ROENTGENOGRAPHIC MEASUREMENT.** By LEE B. LUSTED, M.D., Associate Professor of Radiology, University of Rochester School of Medicine and Dentistry, Rochester, N. Y., AND THFODORE E. KEATS, M.D., Professor of Radiology, University of Missouri School of Medicine, Columbia, Mo. A volume of 176 pages, with 119 figures. Published by The Year Book Publishers, Inc., Chicago, Ill., 1959. Price \$9.00.

In the early days of roentgenology the standards of normal anatomy and measurements were largely derived from texts on morbid anatomy and empiric observation. Later, careful studies established nor-

mal measurements from the living which were of immense value to radiologists. These were available, but scattered in the literature.

The authors of this *Atlas* have brought together in one volume many of these measurements for ready reference. No attempt has been made to record every measurement but the data believed to be most reliable and practical have been chosen.

Following an introductory section on Geometric Distortion of the Roentgen Image and Its Correction, the subject material is divided into nine categories, of which the skeletal system occupies approximately half the volume. Other chapters are devoted to the central nervous system; neck; respiratory system; cardiovascular system; gastrointestinal system; spleen and adrenal glands; urinary tract; pelvimetry and fetometry.

A uniform method of presentation has been adopted throughout the work. Either a roentgenogram or a drawing derived from a roentgenogram is reproduced and the accompanying text is presented under three heads: The *technic* of radiography in the example under consideration is outlined, the *measurements* derived from the film are stated, and their *source* is specified, whether it be a series of cases observed by the authors or reports in the literature. The inclusion of this source material will save the reader many weary hours which might otherwise be spent in a search for the original studies by which the standards were established.

Excellent drawings illustrate the methods employed in making the measurements. A useful index is included.

This volume is indispensable for radiologists and students as well as anatomists.

**DIAGNOSIS OF CONGENITAL HEART DISEASE: A CLINICAL AND TECHNICAL STUDY BY THE CARDIOLOGIC TEAM OF THE PEDIATRIC CLINIC, KAROLINSKA SJUKHUSET, STOCKHOLM.** By Sven R. KJELLBORG, EDGAR MANNHEIMER, ULF RUDHE, AND BENGT JONSSON. A volume of 866 pages, with 727 figures. Published by The Year Book Publishers, Inc., Chicago, Ill., 2d ed., 1959. Price \$28.00.

The first edition of this work, published in 1955, was based on 396 cases of congenital heart disease investigated in the Pediatric Clinic of Karolinska Sjukhuset, Stockholm. This case material has now nearly doubled in amount, additional types of cardiac anomalies have been recognized, and new methods of examination have come into vogue. All methods utilized in investigating congenital heart disease are presented in this new edition, with appropriate emphasis on roentgenology, including angiography. The cases selected for presentation are representative of the entire field of congenital heart disease.

The embryology, roentgen anatomy, physiology of the heart, and technics used in study of congenital heart disease are presented adequately, but not in ex-

haustive detail, in separate chapters preceding the account of the case material. Separate chapters are then devoted to the major cardiovascular defects, such as pulmonary stenosis, atrial septal defect, ventricular septal defect, etc., complicating lesions being included as variations of these. The discussion of each condition includes brief consideration of the embryological defects and the anatomical and physiological features, as well as the clinical findings, special laboratory tests (phonocardiogram, electrocardiogram, vascular pulse recordings, electrokymograms, and catheterization findings), roentgen appearance, and angiograms when these contribute to the diagnosis.

The text is well written and the photographic and radiographic reproductions are excellent.

**DIAGNOSTIC ROENTGENOLOGY.** ROSS GOLDEN, M.D., editor, Visiting Professor of Radiology, University of California at Los Angeles; Emeritus Professor of Radiology, College of Physicians and Surgeons, Columbia University; formerly Director of the Radiological Service, Presbyterian Hospital, New York. [Renewal pages for Vols. I-III, including: The Roentgen-Ray Examination of the Paranasal Sinuses and the Mastoids, by G. W. Grier, M.D.; Roentgenologic Diagnosis of Diseases of the Urinary Tract, by Marcy L. Sussman, M.D., and George Jacobson, M.D.; The Roentgen Diagnosis of Fractures and Dislocations, by L. Henry Garland, M.B.; Dental Roentgenology, by E. V. Zegarelli, D.D.S.; New Index Pages.] Loose-leaf renewal pages 2.1-2.49; 8.1-8.167: 11.1-11.32; 12.1-12.82; 1160-1210. Published by Williams & Wilkins Co., Baltimore 2, Md., 1959. Price \$60.00.

Four new sections of the loose-leaf compendium on Diagnostic Roentgenology inaugurated in 1936 under the editorship of Dr. Ross Golden lend emphasis—if such is needed—to the expanding scope of radiology. The passing years have witnessed many advances in technic and diagnosis which have necessitated revision and expansion of earlier contributions, to which the loose-leaf format is particularly adaptable. The following chapters make up the present revision.

In Volume I, the section on Paranasal Sinuses and Mastoids has been rewritten by Dr. George W. Grier, being expanded from 25 to 49 pages. New material has been added on technic and on sinusitis in children. Many new illustrations are presented, and others have been replaced to advantage. This section has been definitely improved.

In Volume II, the section on Diseases of the Urinary Tract has been rewritten by Drs. Marcy R. Sussman and George Jacobson, being increased from 131 to 167 pages. About 75 additional illustrations have been included and many new ones have been substituted for older views. Unfortunately some are in the negative and some in the positive phase, which detracts somewhat from continuity. The section, however, shows improvement and modernization.

In Volume III, Dr. L. Henry Garland has revised the section on Fractures and Dislocations. This has been expanded only slightly and, while the illustrations are about the same in number, many well advised substitutions have been made. Improvements have also been made in the text.

Dental Roentgenology, also in Volume III, now occupies 82 instead of 38 pages. The text is much more inclusive and discusses diseases and tumors which affect the mandible much more extensively than was done earlier. Both illustrations and text are greatly improved.

These new pages represent the policy of the Editor and Publishers of keeping these volumes up to date by periodic revision of the various sections. The entire work is recommended as an excellent source of information on diagnostic roentgenology for students, residents, and practicing radiologists.

**MEDICAL RADIOGRAPHIC TECHNIC.** Prepared by Technical Service, X-Ray Department, General Electric Company, under the original editorial supervision of the late GLENN W. FILES. Revision by WILLIAM L. BLOOM, JR., JOHN L. HOLLOWBACH, R. T., JAMES A. MORGAN, R.T., AND JOHN B. THOMAS, R.T. A volume of 386 pages, with numerous figures and tables. Published by Charles C. Thomas, Springfield, Ill., 2d ed., 1959. Price \$11.00.

The late Glenn W. Files supervised the original publication of *Medical Radiographic Technic* in 1943. With the collaboration of his associates in the X-Ray Department of the General Electric Company, a textbook was compiled which met with such popular demand that in fifteen years eleven printings were required. Now the text has been revised and much pertinent information has been added to make a more complete handbook. Angiocardiography, cerebral angiography, abdominal aortography, venography, and many other specialized procedures, including magnification technics, are adequately discussed and illustrated by excellent reproductions. These additions to a text, which has already proved its usefulness, will be most helpful to the radiologist and his teaching staff.

**PROTECTION IN DIAGNOSTIC RADIOLOGY.** Edited by B. P. SONNENBLICK. A volume of 346 pages, with figures and tables. Published by Rutgers University Press, New Brunswick, N. J., 1959. Price \$7.50.

This compilation of articles previously published in various medical journals on the subject of radiation protection not only covers diagnostic radiology, as indicated by the title, but also includes isotope therapy. Probably no two people would agree on the articles to be selected for such a book, but the present choice is a good one. The book jacket states that the work is meant for "physicians, dentists, osteopaths,

veterinarians, chiropractors, podiatrists, and their technical assistants." The radiologist will have little need of it, since he should be familiar with the journals from which the articles were taken. It is convenient, however, to have scattered material on a given subject collected in a single volume.

**KLINIK UND PRAXIS DER UROLOGIE: KLINIK, INDIKATION, DIAGNOSTIK, OPERATIVE UND INSTRUMENTELLE EINGRiffe, NACHBEHANDLUNG.** In zwei Bände. By PROF. DR. WERNER STAehler, Leiter der Urologischen Abteilung der Chirurgischen Universitätsklinik Tübingen. With Foreword by Prof. Dr. Th. Naegeli, Tübingen. Band I, 892 pages, with 1,034 figures; Band II, 864 pages, with 641 illustrations and author and subject indexes. Published by Georg Thieme, Herdweg 63, (14a) Stuttgart, Germany, 1959. Price DM 240.—(\$57.15), per volume. Distributed in the United States and Canada by the Intercontinental Medical Book Corporation, New York 16, N. Y.

In 1941, Dr. Staehler published a book, *Operative Cystoscopy*, the success of which stimulated him to undertake a broader, more definitive urologic work to include clinical practice, roentgenology, cystoscopy, endoscopic surgery, and open surgery of the diseases of the urogenital system. The results of these studies appear in two volumes, under two main headings: Medical Urology and Technical Aspects, the latter being further divided into Diagnosis and Therapy. A brief introductory chapter of a score of pages outlines urologic history, defines the terms which are used in the book, lists abbreviations, and also enumerates current standard urologic texts. The usual sequence of subjects begins with the chapter on developmental anomalies and carries through inflammatory changes in the kidneys, urogenital tuberculosis, renal, ureteral and bladder calculi, ureteral obstruction, bladder neck obstruction and tumors, in Volume I, and anuria, nephritis, circulatory disturbances, and hematuria, trauma, foreign bodies, etc., and diseases of the male genital tract, in Volume II. The division of the material is on the basis of the type of disease and not specific organ pathology. The descriptions and deductions of the basic disease groups are excellent with good augmentation by case histories, quotations from hospital records, and roentgenograms.

Volume II contains also the chapters devoted to technic, including blood chemistry, function tests, roentgenography, cystoscopy, anesthetic procedures, catheterization, and surgical technics. An index to the two volumes is appended.

This publication is of the usual high quality maintained by Georg Thieme Verlag in Stuttgart: the books are well bound, the illustrations are good, some in color, and the typography is conducive to easy reading.

RÖNTGENDIAGNOSTIK BEIM NEUGEBORENEN UND SÄUGLING. By DR. HERMANN G. WOLF, Assistent der Universitäts-Kinderklinik Wien. With Foreword by Prof. Dr. K. Kundratitz, Vorstand der Universitäts-Kinderklinik Wien. A volume of 318 pages, with 570 illustrations on 370 figures. Published by Wilhelm Maudrich, Franz-Josefs-Kai 23, Vienna 1, Austria, 1959. Price \$23.60.

This carefully composed text is a summary of the author's experience in pediatric roentgenology since 1946. Because this is only the second publication on x-ray diagnosis to emerge from the Childrens' Clinic of the University of Vienna—the first being Swoboda's work on the skeleton of the child—one can be certain that the book is not part of a literary flooding such as comes from some similar clinics. The sphere of interest is centered on the x-ray examination of the newborn, both at term and premature, and the nursing infant. The subject matter is thus more extensive than that of the usual monograph but less than that of the conventional pediatric text. The predominant modality for diagnosis

is plain roentgenography, justified by Dr. Wolf on the ground it is ordinarily the only available technic and that extensive contrast procedures are usually not feasible in infants, while studies requiring large exposures are somewhat dangerous in the newborn.

The book is divided into three almost equal parts: I. The Skeleton; II. The Thorax; III. The Abdomen. The strongest feature of Part I is the chapter on the skull and the weakest is that on fractures of the newborn. In Part II, on the thorax, the chapter on congenital heart disease is purely token but probably sufficient for a book of this nature. The best illustrated section is that on mediastinal emphysema. For the abdomen (Part III), the single survey soft-tissue film is considered paramount, and certainly this view suffices for diagnosis or for a proper therapeutic decision in the majority of instances. Of a particular interest are the illustrations on spontaneous pneumoperitoneum. The book is attractively printed on a hard semigloss paper and beautifully illustrated. A general index and bibliography, with a list of standard pediatric roentgen texts, are included.



## ABSTRACTS OF CURRENT LITERATURE

### ROENTGEN DIAGNOSIS

#### The Head and Neck

MCKISOCK, WYLIE. Some Aspects of Subarachnoid Haemorrhage—A Symposium. I. Clinical and Surgical Aspects of Ruptured Intracranial Aneurysms.....

CRAWFORD, T. Some Aspects of Subarachnoid Haemorrhage—A Symposium. II. Intracranial Aneurysms—Pathological Aspects....

PERRETT, L. V., AND BULL, J. W. D. Some Aspects of Subarachnoid Haemorrhage—A Symposium. III. The Accuracy of Radiology in Demonstrating Ruptured Intracranial Aneurysms.....

BALKISSOON, BASDEO, ET AL. Cerebral Arteriography—Diagnostic Value in Cerebrovascular Disease.....

PYGOTT, F., AND HUTTON, C. F. Vertebral Arteriography by Percutaneous Brachial Artery Catheterisation.....

TARP, OLE. Tomography of the Temporal Bone with the Polytome.....

SCHAFFROT, H. J. Symmetric Familial Cerebral Calcification.....

LEVITT, JESSE M., AND KRAVITZ, DANIEL. Lacrimal Air Anomalies.....

#### The Chest

LÜDEKE, H., AND PÖSCHL, M. An Accessory Lung Communicating with the Bronchial Tree.....

POHL, R. The Origin and Diagnosis of Alveolar-Cell Carcinoma of the Lung (Pulmonary Adenomatosis).....

LISSNER, J. The Condition of the Pulmonary Vessels in Bronchial Carcinoma: An Electrokymographic Investigation.....

CHRISTOFORIDIS, A. J., AND BROWNING, R. H. Pulmonary Tuberculosis Associated with Carcinoma of the Lung.....

BEÜNNER, S. Bronchogenic Carcinoma Arising in a Lung Cyst. Report of a Case.....

CROW, NEIL E., AND BROGDON, BYRON G. Cystic Lung Lesions from Metastatic Sarcoma.....

CHASE, JOHN F., ET AL. Pulmonary Infiltration and Fibrosis of Unknown Etiology. The Risk of Developing Active Pulmonary Tuberculosis.....

NICE, CHARLES M., JR., ET AL. Pulmonary Manifestations in Collagen Diseases.....

SUWANIK, ROMSAI, AND HARINSUTA, CHAMLONG. Pulmonary Paragonimiasis. An Evaluation of Roentgen Findings in 38 Positive Sputum Patients in an Endemic Area in Thailand.....

ROTH, M. The Problem of Absorption of Liquids from the Lung—Particularly Bronchographic Contrast Material.....

#### The Heart and Blood Vessels

ESPINO-VELA, J. Rheumatic Heart Disease Associated with Atrial Septal Defect: Clinical and Pathologic Study of 12 Cases of Lutembacher's Syndrome.....

JONES, REVERDY H., JR. Beriberi Heart Disease. 943

HOFFMAN, F. G. Postoperative Myxedema Cardiopathy: An Unusual Instance Which Developed in the Immediate Postoperative Period. Case Report and Review of the Literature.....

GRASSER, H. A Roentgenkymographic Sign of the Gastrocardiac Syndrome of Römhild.....

GORE, IRA, ET AL. Congenital Aneurysms of the Coronary Arteries with Report of a Case.....

PYÖRÄLÄ, KALEVI, ET AL. Hypoplasia of the Aorta: Report of a Case.....

SAMMONS, BILLY P., ET AL. Contrast Visualization of the Venae Cavae in Management of Lymphoma.....

KAY, JEROME HAROLD, ET AL. High Pressure Patent Ductus Arteriosus. A Report of Three Cases.....

STEINBERG, ISRAEL. Roentgen Diagnosis of Anomalous Pulmonary Venous Drainage of Right Lung into Inferior Vena Cava. Report of Three New Cases.....

GIMES, B., AND HORVÁTH, F. Varicosity of the Pulmonary Vein.....

ZOLLINGER, H. U., AND HENSLER, L. Old Massive Pulmonary Embolism.....

BARTLEY, OSBORNE, AND WICKBOM, INGMAR. Angiography in Soft Tissue Hemangiomas.....

LESSMANN, FRANZ P., AND SCHOBINGER, ROBERT. Intra-Osseous Venography in Portal Hypertension.....

939

The Digestive System

CIARPAGLINI, L., AND IANNACONE, G. Dynamic Changes of the Varicose Esophagus. A Cineradiographic Study with the Image Intensifier.....

KOPPENSTEIN, E. The Meaning of a Gas Bubble Projected Above the Level of the Diaphragm.....

ROTHHOFF, G., AND VIETEN, H. Acute Gastric and Duodenal Ulceration Following Endothoracic Surgery.....

VAN DER REIS, MAURICE L., ET AL. Hyperplasia of Brunner's Glands.....

VARADARAJAN, M. G. Interposition of a Loop of Ileum Between the Dome of Diaphragm and Liver.....

BENJAMIN, H. B., AND BECKER, A. B. A Vascular Study of the Small Intestine.....

BECKER, ALAN B., AND BENJAMIN, H. B. New Concept of the Small Intestine Vascular Pattern .....

WILBUR, RICHARD S., AND BOLT, ROBERT J. Incidence of Gall Bladder Disease in "Normal" Men.....

McCORT, JAMES J. Radiographic Signs of Acute Suppurative Cholecystitis.....

CORNELL, CARLETON M., AND CLARKE, ROBERT. Vicarious Calcification Involving the Gall-bladder.....

CIMMINO, CHRISTIAN V. The Fatty Meal in Oral Cholecystography. A Reevaluation, with Comments on "Tumors" of the Gall-bladder, and on Its Rokitansky-Aschoff Sinuses.....

SALTZMAN, GEORG-FREDRIK. Side-Effects of Biligrafin Forte.....

#### The Musculoskeletal System

MASON, R. M., ET AL. A Comparative Radiological Study of Reiter's Disease, Rheumatoid Arthritis and Ankylosing Spondylitis.....

BEAERS, OLIVER H., AND SCHMIDT, HERBERT W. Dysphagia Caused by Hypertrophic Changes in the Cervical Spine. Report of Two Cases.....

ESSER, C. Bony Bridges Following Transverse Process Fractures of the Lumbar Vertebrae.....

FASSBENDER, C. W., ET AL. Results of Abrodil Myelography in Prolapse of the Lumbar Intervertebral Disk.....

SCOTT, J. C. Resolving Scoliosis.....

HALMAGYI, DENIS F. J. Dorsal Kyphosis in Chronic Obstructive Lung Disease.....

MUSTARD, W. T., AND DUVAL, F. W. Osteoid Osteoma of Vertebrae.....

RING, P. A. Congenital Short Femur. Simple Femoral Hypoplasia.....

JONES, P. R. M., AND DEAN, R. F. A. The Effects of Kwashiorkor on the Development of the Bones of the Knee.....

BRADDOCK, G. T. F. Experimental Epiphysial Injury and Freiberg's Disease.....

#### Gynecology and Obstetrics

NARIK, G. The Method of Transfer of Labour Contractions to the Contents of the Uterus.....

GERACE, J. R. The Mid-Pelvis in Pelvimetry.....

FRISCHKORN, R. Danger of Embolism with Oily Contrast Media. A Study of the Problem of Media in Hysterosalpingography.....

#### The Genitourinary System

FICHARDT, T. Screening Urethrocytography of Adult Bantu Males Under Manometric Control. Normal and Pathological Findings.....

FELTON, LESTER M. Should Intravenous Pyelography Be a Routine Procedure for Children with Cryptorchism or Hypospadias?.....

BLOOM, JOSEPH, AND RICHARDSON, J. F. The Usefulness of a Contrast Medium Containing an Antibacterial Agent (Retrografen) for Retrograde Pyelography.....

#### Miscellaneous

MACCARTY, COLLIN S., ET AL. Dermoid and Epidermoid Tumors in the Central Nervous System of Adults.....

DECKER, HENRY G., ET AL. Epidural Tuberculous Abscess Simulating Herniated Lumbar Intervertebral Disk. A Case Report.....

BOSWELL, W. L. Roentgen Aspects of Blastomycosis.....

#### Technic

ROSWIT, BERNARD, ET AL. Transverse Laminography: The Third Dimension in Body Section Roentgenography: Applications in Radiation Therapy.....

SAMUEL, ERIC. Serial Tunnel for Radiography During Operations.....

#### RADIOTHERAPY

IRONSIDE, WILLIAM M. S., ET AL. Carcinoma of the Larynx. Results Obtained by Surgery and External Radiation in Ninety-Three Cases.....

CASKEY, J. A. Simple Mastectomy and Post-operative Irradiation for Carcinoma of the Breast. A Report from the Saint John General Hospital.....

GERBASI, F. S., ET AL. Primary Fibrosarcoma of the Lung in a Young Child. A Case Treated by Lobectomy and Cobalt Therapy.....

HELLRIEGEL, WERNER. Advantage of Aimed Pendulum Roentgen Therapy of Esophageal Carcinoma.....

KROKOWSKI, E. Sieve (Grid) Radiotherapy of Subcutaneous Lymphoma.....

FRAZER, JOE W., JR. Malignant Lymphomas of the Gastrointestinal Tract.....

DARGEON, HAROLD W., ET AL. Hemangioma with Thrombocytopenia.....

LENTINO, WALTER, ET AL. Treatment of Pterygium by Surgery Followed by Beta Radiation. An Analysis of 256 Cases.....

MEREDITH, H. CLARKSON, JR. Subacute Thyroiditis.....

BEWLEY, D. K., ET AL. Integral Doses at 200 kV and 8 MeV.....

#### RADIOISOTOPES

BLOMFIELD, G. W., ET AL. Treatment of Thyrotoxicosis with  $^{131}\text{I}$ . A Review of 500 Cases.....

HOLMAN, W. P., ET AL. The Treatment of Disease of the Thyroid by Irradiation.....

CARTER, ANNE C., ET AL. Effect of Oral Lipiodol on Thyroidal  $^{131}\text{I}$  Uptake and Serum Protein-Bound Iodine Concentration.....

GREENSPAN, RICHARD H., ET AL. Isotope Circulation Studies in Congenital Heart Disease.....

ISLEY, J. K., ET AL. The Use of Radioactive Isotopes in the Study of Colonic Absorption.....

GLASS, GEORGE B. JERZY. Deposition and Storage of Vitamin B <sub>12</sub> in the Normal and Diseased Liver.....	961	PETERSON, RICHARD E., ET AL. A Primer on Radiation Hazards for Physicians.....	964
PERRY, SEYMOUR, ET AL. Rate of Production of P <sup>32</sup> -Labeled Lymphocytes.....	962	BLOOMFIELD, J. A. Half a Century of Progress in Radiodiagnostic Protection.....	964
KRISS, JOSEPH P., ET AL. Effect of Anaemia and Transfusion Polycythaemia on Phosphorus and Iron Uptake in Erythrocyte Precursors in Rat Bone Marrow, Studied by Means of a Triple Tracer Technique with <sup>32</sup> P, <sup>59</sup> Fe and <sup>51</sup> Cr.....	962	DACQUISTO, MICHAEL P. Acquired Radioresistance. A Review of the Literature and Report of a Confirmatory Experiment.....	965
		STORER, JOHN B. Rate of Recovery from Radiation Damage and Its Possible Relationship to Life Shortening in Mice.....	965
		ELLINGER, F. Short and Long-Term Observations Concerning the Effect of Homologous and Heterologous Cell-Free Spleen Extracts on Radiation Mortality in Mice and Guinea Pigs.....	965
SCHREINER, BERNARD F., AND GREENDYKE, ROBERT M. Radiation Nephritis. Report of a Fatal Case.....	962	ELDRED, EARL. The Response of Eosinophils to Total-Body X-Radiation of the Monkey.....	965
THOMAS, E. DONNALL, ET AL. Irradiation of the Entire Body and Marrow Transplantation: Some Observations and Comments.....	963	BARBER, ALBERT A., AND WILBUR, KARL M. The Effect of X-Irradiation on the Antioxidant Activity of Mammalian Tissues.....	966
CRAMER, LESTER M., ET AL. Burn Following Accidental Exposure to High Energy Radiation.....	963	RAMBACH, W. A., ET AL. The Effect of Single and Multiple Doses of Co <sup>60</sup> Gamma-Radiation and Fission Neutron Radiation on the Incorporation of Fe <sup>59</sup> into the Rat Erythropoietic System.....	966
BISHOP, HARRY A., ET AL. Reducing Gonad Irradiation in Pediatric Diagnosis.....	964		



## ROENTGEN DIAGNOSIS

### THE HEAD AND NECK

Some Aspects of Subarachnoid Haemorrhage—A Symposium. I. Clinical and Surgical Aspects of Ruptured Intracranial Aneurysms. Wylie McKissock. Brit. J. Radiol. 32: 79-83, February 1959. (St. George's Hospital, London, S. W. 20, England)

Of 2,174 cerebrovascular accidents (1940-1957 inclusive), 1,013 were due to ruptured aneurysms, 253 to ruptured angioma, and 363 to unexplained subarachnoid hemorrhage. Subarachnoid hemorrhage is a physical sign established by lumbar puncture and, prior to treatment, the pathological cause of the bleeding must be demonstrated. Investigation begins with compression of each carotid separately for a period of ten minutes. This test establishes the patient's tolerance to ligation of the common carotid in case such a procedure is required. Carotid compression is applied prior to angiography since the latter may cause tenderness and/or hematoma formation in the neck. Cerebral angiography should include such exposures as are necessary to demonstrate the lesion completely. Oblique views are particularly important in aneurysms of the anterior cerebral/anterior communicating complex. Presence or absence of flow of contrast material across the circle of Willis is determined by further injections, with compression of the opposite carotid.

Clinical symptoms and signs vary considerably for each aneurysmal site, depending on the direction of the stream of blood at the instant of rupture. The author advocates operation within a few days following the hemorrhage, in contrast to the fourteen days or more usually allowed. He feels that a long delay is detrimental because of the high mortality of recurrent hemorrhage.

Certain surgical principles have been applied to aneurysms in different sites. The results await further study, but some general statements are made: (1) In *anterior cerebral/anterior communicating aneurysms*, if adequate crossflow is present and the aneurysm fills from one side only, ligation of the feeding anterior cerebral artery is performed. If there is inadequate crossflow, the neck of the aneurysm is ligated. (2) For *middle cerebral aneurysm*, occlusion of the neck of the aneurysm is the ideal procedure, but is not always possible. (3) In *posterior communicating aneurysms*, common carotid ligation is performed except in those patients who do not tolerate preliminary compression of the vessel.

Twelve roentgenograms; 1 table.

S. B. HAVESEN, M.D.  
Los Angeles, Calif.

Some Aspects of Subarachnoid Haemorrhage—A Symposium. II. Intracranial Aneurysms—Pathological Aspects. T. Crawford. Brit. J. Radiol. 32: 84, February 1959. (St. George's Hospital Medical School, London, S. W. 1, England)

Three factors enter into the pathogenesis of cerebral aneurysms—so-called "berry" aneurysms: (1) developmental faults in the muscular coat of the arteries at points of branching and anastomosis; (2) atherosomatous plaques coinciding with a point of medial weakness, leading to further weakening at that site; (3) elevated blood pressure, which may produce aneurysms in vessels with only minor defects in the muscular wall.

The muscular coat of the artery ceases abruptly at

the neck of the aneurysm, the elastic lamina may proceed slightly into the body, but the fundus is comprised of an attenuated layer of hyaline fibrotic tissue. The site of rupture in 163 aneurysms was fundal in 105 (64 per cent), lateral in 17 (10 per cent), cervical in 3 (2 per cent) and undetermined in 38 (24 per cent). Leakage as opposed to rupture is uncommon.

Cerebral aneurysms occur more frequently in an asymmetrical circle of Willis. They are often associated with congenital cystic disease of the kidneys.

S. B. HAVESEN, M.D.  
Los Angeles, Calif.

Some Aspects of Subarachnoid Haemorrhage—A Symposium. III. The Accuracy of Radiology in Demonstrating Ruptured Intracranial Aneurysms. L. V. Perrett and J. W. D. Bull. Brit. J. Radiol. 32: 85-92, February 1959. (St. George's Hospital, London, S. W. 20, England)

The accuracy of angiography in diagnosis of intracranial aneurysms causing subarachnoid hemorrhage was investigated in 219 autopsied cases. Nine patients with vertebral and basilar artery aneurysms with normal carotid arteriograms died before vertebral injections were obtained. Of the remaining 210 cases, 187 (82 per cent) were accurately diagnosed. The causes of diagnostic error in the remaining 23 cases (11 per cent) are divided into five groups. (1) Arterial spasm prevented the demonstration of an aneurysm in 5 instances (2.5 per cent). None of these cases showed evidence of thrombosis at autopsy. (2) "Observer errors" occurred in 6 cases in which review of films showed a visible aneurysm. Originally, the aneurysm was either not seen or was misinterpreted as a vessel loop. (3) Inadequate examination was performed in 4 cases. Films of poor quality accounted for 3 of these and in the other, oblique projections were not obtained. (4) In 4 cases (2 per cent), the arteriograms were normal even in retrospect. The aneurysms were described as "small" in these cases. (5) There were 4 patients in whom an aneurysm diagnosed radiologically was intact at autopsy, and a second aneurysm, not observed, had ruptured.

The potential accuracy of arteriography is approximately 96 per cent if "observer error" is minimized by additional experience, and if adequate projections of the cerebral vessels are obtained. Three standard projections are used (lateral, anteroposterior, and oblique); in difficult cases, reverse oblique, submentovertical, and periorbital views may be necessary. The last two views are particularly useful in demonstrating middle cerebral aneurysms. Thrombosis did not prevent visualization of an aneurysm in any instance in this series.

Nineteen roentgenograms; 1 table.

S. B. HAVESEN, M.D.  
Los Angeles, Calif.

Cerebral Arteriography—Diagnostic Value in Cerebrovascular Disease. Basdeo Balkissoon, John B. Johnson, Jesse B. Barber, and Clarence S. Greene. J.A.M.A. 169: 676-682, Feb. 14, 1959. (Howard University, Washington 1, D. C.)

Report is made of the authors' experience with 56 patients undergoing 80 cerebral arteriographic studies. Local infiltration anesthesia about the carotid artery

obviates the need of general anesthesia. A standard arterial needle (Cournand 18-gauge) is inserted through the skin and threaded carefully into the common carotid artery, the tip being guided into the internal carotid when possible. A polyethylene tube connects the needle with the injecting syringe. About 10 c.c. of 60 per cent Renografin is rapidly introduced into the artery and films of the cranium are obtained at one-second intervals for eight seconds after injection. With two such injections, anterior and lateral exposures are made, demonstrating the arterial and venous phases of the cerebral circulation. Undesirable side effects occurred in only 9 patients; 7 of these were in the first 28 injections. No lasting adverse complications have been encountered. The procedure has tended to be most helpful in congenital cerebral aneurysm (7 cases), congenital arterial malformation (5 cases), cerebral thrombosis (9 cases), and subdural or intracerebral hematomas (7 cases). Findings in 57 patients examined are presented in a table.

A plea is made by the authors for greater use of cerebral arteriography in clinical medicine, with emphasis on the fact that the procedure is not technically difficult to perform and carries only a low risk.

Ten roentgenograms; 2 tables.

JAMES W. BARBER, M.D.  
Cheyenne, Wyo.

**Vertebral Arteriography by Percutaneous Brachial Artery Catheterisation.** F. Pygott and C. F. Hutton. *Brit. J. Radiol.* 32: 114-119, February 1959. (Central Middlesex Hospital, London, N. W. 10, England)

During a six-month period, 12 patients were examined by vertebral arteriography by percutaneous brachial artery catheterization. Six of the cases are described in detail.

Under local anesthesia, the brachial artery is punctured percutaneously with a Seldinger cannula, size PR 160. Damage to the medial nerve is avoided by carefully noting the patient's reaction. Following puncture, the brachial artery is catheterized for a distance of 18 inches from the puncture site, when a slight resistance will be felt. A test injection of 10 c.c. of 35 per cent Hypaque is made. An anteroposterior film of the root of the neck and thoracic inlet on the appropriate side, taken at this point, almost invariably revealed that the catheter tip had been placed near the origin of the vertebral artery, and satisfactory filling of the vessel was obtained on the first attempt. Next, the intracranial branches are studied, following further injections of 15 c.c. of 35 per cent Hypaque for each projection.

In 2 of the reported cases thrombotic lesions of the vertebral artery were demonstrated; 1 showed displacement of the vertebral artery by cervical spine osteophytes, and in 1 there was a large angioma of the neck. In 1 patient injection of 45 per cent Hypaque resulted in transient homonymous hemianopsia. Subsequently, the 45 per cent concentration was reserved for vertebral arteries of small caliber.

The method described is useful in vertebral artery thrombosis and in other diseases of the basilar system when direct puncture has failed. In cases of subarachnoid hemorrhage direct puncture is preferred, since it affords better concentration of medium in the intracranial portion of the basilar system.

Twelve roentgenograms. S. B. HAVEON, M.D.  
Los Angeles, Calif.

**Tomography of the Temporal Bone with the Polytome.** Ole Tarp. *Acta radiol.* 51: 105-116, February 1959. (County Hospital, Copenhagen, Denmark)

The author discusses the advantages of curvilinear tomography in the examination of bones with special reference to the temporal bone. His material comprised 30 normal subjects and 40 patients operated upon for chronic otitis media. Tomography is done with circular or similar symmetrical movements. With the polytome, the roentgen tube and the film travel in curvilinear paths around the axis of rotation in opposite directions. The points in the plane of the axis do not move in the film and therefore become sharply defined.

The great advantage of tomography of the temporal bone is the accurate information afforded concerning the condition of the attic, which is not obtainable by ordinary roentgenography. Active osteitis and, in many cases, cholesteatoma may be revealed by the former procedure, which also allows evaluation of the condition of the ossicles. Tomography also gives definite information as to the antral region.

A comparison of the operative and tomographic findings showed good agreement as to the patho-anatomical details. However, only in cases with more marked bone destruction was it possible to differentiate otitis media in combination with osteitis from otitis media associated with cholesteatoma. Advanced destruction of the attic and ossicles and sharply defined cavities in the antral region are nearly always due to a cholesteatoma; two cavities, however, were filled with granulations. Denudation of the dura was demonstrated only in 1 of 4 cases. A fistula to the lateral semicircular canal was revealed in 2 cases.

Sixteen tomograms; 1 diagram; 2 tables.

THEODORE E. KEATS, M.D.  
University of Missouri

**Symmetric Familial Cerebral Calcification.** H. J. Schaefroth. *Schweiz. med. Wehnschr.* 88: 1269-1273, Dec. 13, 1958. (In German) (Inselspital, Bern, Switzerland)

Symmetrical cerebral calcifications are usually found in the basal ganglia and nucleus dentatus. It is believed that in these cases pseudoline, a calcium-free organic colloid, which normally exists only in small quantities, is deposited in considerably greater amounts which undergo calcification. The resulting circulatory disturbances cause various neurological and psychiatric symptoms.

A familial form of symmetric cerebral calcification, with a possible 7 cases in three generations is described. Five cases have been definitely diagnosed, one appeared probable, and the last one was doubtful.

Clinically, oligophrenia, certain psychic disturbances such as those associated with the psycho-organic syndrome, and, particularly, an extrapyramidal symptomatology dominate the picture. Endocrine disturbances, especially chronic hypoparathyroidism, and various neurological diseases may play a role in individual cases.

Eight roentgenograms; 1 table.

HERBERT POLLACK, M.D.  
Chicago, Ill.

**Lacral Air Anomalies.** Jesse M. Levitt and Daniel Kravitz. *Arch. Ophth.* 61: 9-13, January 1959. (515 Ocean Ave., Brooklyn 26, N. Y.)

Two cases of lacral air anomalies are reported.

The first patient, a 13-year-old girl, complained of inconstant tearing of the right eye, especially when laughing or coughing, of a few years duration. Palpation over the right lacrimal sac area disclosed a tiny compressible, invisible swelling, with crepitation loud enough to be heard a few feet away. On dacrocystography of the affected side, the lacrimal tract was well visualized; the sac was overfilled; and the system was patent. There was delayed emptying from the nasolacrimal duct, traces of the contrast medium being still evident two hours after injection. An unusual finding was a diverticulum with a narrow neck at the lowermost position of the lacrimal sac, and located slightly anterior and lateral to it; the diverticulum retained the medium almost completely after the lacrimal system had emptied. This patient was thought to have two congenital anomalies, one at each end of the lacrimal tract: valvular insufficiency and a cystic diverticulum of the sac. Dacryocystorhinostomy was advised, but was postponed because it was felt that the symptoms were not sufficiently distressing.

The second patient, a 36-year-old woman, had had tearing for three months and when she blew her nose fluid, bubbling like soda water, came into her left eye. There was no visible swelling of the lacrimal sac. Loud crepitations were occasionally heard on palpation of the sac. Dacrocystography of both sides showed the lacrimal tracts well visualized and patent. The right side was normal. On the left there was residual contrast medium in the tract after forty-five minutes, with marked distention of the sac and nasolacrimal duct. This patient had incompetency of the valvular mechanism of the nasolacrimal duct, permitting air to be blown directly into the eye. In addition, there was an element of infection from the nasal secretions. The patient was cautioned to blow her nose gently, one nostril at a time, while pressing firmly on the lacrimal sac area.

Six roentgenograms; 1 photograph.

### THE CHEST

**An Accessory Lung Communicating with the Bronchial Tree.** H. Lüdeke and M. Pöschl. *Fortschr. a. d. Geb. d. Röntgenstrahlen* 89: 548-551, November 1958. (In German) (M. P., Universitätsklinik, Munich, Germany)

The authors report a case of accessory lung, proved at operation, and shown to communicate with the bronchial system of the right upper lobe by means of a saccular dilated bronchus. The patient, a 27-year-old woman, had experienced bouts of pneumonia recurring over a period of eight years. Roentgenographically, a thick-walled cavity surrounded by sharply demarcated shadows was demonstrated in the left lung. At surgery a tumor 4 to 5 cm. in diameter was removed. This was shown microscopically to be composed of lung tissue poorly aerated by reason of its connection with an ectatic bronchus.

An accessory lung arises from the foregut very early in the embryonic life. Only rarely is there a connection with the bronchial tree (sequestered lung). When intrathoracic, the accessory lung tends to be on the left side, dorsal and basal in location, and almost invariably extrapleural, although sunk into the true lung. The thoracic, intercostal, renal, or one of the phrenic arteries may supply it and it may be drained by the hemi-

azygos, portal, or suprarenal veins. Clinically, most cases are silent.

Three roentgenograms.

WILLIAM F. WANGNER, M.D.  
Royal Oak, Mich.

**The Origin and Diagnosis of Alveolar-Cell Carcinoma of the Lung (Pulmonary Adenomatosis).** R. Pohl. *Fortschr. a. d. Geb. d. Röntgenstrahlen* 89: 527-533, November 1958. (In German) (Lange Gasse 63, Vienna 8, Austria)

A condition originally termed pulmonary adenomatosis, by Melassez in 1876, has since been reported under such designations as cystopapillary lung tumor, adenomatous pneumonia, and alveolar-cell carcinoma. The disease tends to afflict young adults, particularly females, is induced by no known poison or organism, runs a comparatively rapid course, and may be suspected roentgenologically. Although a virus causes a similar ailment in South African sheep, such an origin in man remains unproved.

Histologically the tumor consists of cylindrical cells filling and lining the alveoli without destroying them and with no evidence of squamous metaplasia. Multicentricity is such a common feature that comparison has been made to the multiple carcinomas which accompany intestinal polyposis; in fact, the similarity may be real and the disease the pulmonary equivalent of the intestinal disorder. Once the tumor has started in one or more air sacs, it continues to spread alveolarly. From one air sacule to the next the entire lung interior becomes coated with these surface metastases. In addition, small blocks of cells may become dislodged, resulting in a bronchial spread.

Modern awareness of the disease and present-day roentgen technics now permit consideration of the diagnosis in the living subject. The case of a 42-year-old female with bilateral pulmonary infiltrates, abundant sputum, and severe dyspnea is detailed. The diagnosis of alveolar-cell carcinoma was made clinically after exclusion of pulmonary metastases from a pancreatic tumor, disseminated tuberculosis, sarcoidosis, mycotic lung disease, pneumoconiosis, and Hodgkin's disease. Autopsy demonstrated pulmonary adenomatosis with lymph-node metastases. In a second case, in a woman of seventy-six, a clinical diagnosis was also made. Here again the gross autopsy report confirmed the impression of alveolar-cell carcinoma, although microscopic study of the tissues showed a widespread necrotizing pneumonia not associated with any tumor.

In conclusion, the author states that alveolar-cell carcinoma is a specific, relatively rare tumor, not related at all to bronchogenic carcinoma, not metastatic other than from the lung, and difficult but not impossible to diagnose in the living. One must still allow for an element of diagnostic error in this disease.

Three roentgenograms.

WILLIAM F. WANGNER, M.D.  
Royal Oak, Mich.

**The Condition of the Pulmonary Vessels in Bronchial Carcinoma: An Electrocardiographic Investigation.** J. Lissner. *Fortschr. a. d. Geb. d. Röntgenstrahlen* 89: 534-544, November 1958. (In German) (Medizinische Universitätsklinik, Frankfurt a. M., Germany)

Electrokymography for the study of variations in vascular density in the central and peripheral lung fields

has the advantage over angiography that no injection is required.

The author studied with the electrokymograph 80 patients with lung tumor and 200 normal controls. Recordings were made from a photomultiplier RCA electron tube No. 931A with simultaneous recordings of the electrocardiograms and of the carotid pulse. There were 6 recordings for each chest, 3 on each side, covering upper, middle, and lower lung fields. In the normal subjects all 6 curves were of the arterial type, very similar to the pulsations of the pulmonary arteries but with a somewhat smaller incisura.

In the presence of lung tumor, the characteristic electrokymographic sign of Marchal was observed. The curves were absent over lung areas supplied by a bronchus or vessel involved by the carcinoma even when no radiological changes were otherwise apparent. Bronchial cancer produced a lack of vascular variations in density in the lung field peripheral to the carcinoma, indicating a tremendously diminished blood supply to that portion of the lung. This sign is not specific, however, as a similar decrease in blood flow may result from emphysema, atelectasis (regardless of cause), or the collapsed lung of a pneumothorax. In spite of its non-specificity, it is nevertheless an aid, with other radiologic investigations, in tumor diagnosis.

Results of 10 case studies are reported in detail.

Seventeen figures, including 9 roentgenograms.

WILLIAM F. WANGNER, M.D.  
Royal Oak, Mich.

**Pulmonary Tuberculosis Associated with Carcinoma of the Lung.** A. J. Christoforidis and R. H. Browning. *Arch. Int. Med.* 103: 231-238, February 1959. (Ohio Tuberculosis Hospital, Ohio State University Campus, Columbus 10, Ohio)

Coexisting pulmonary tuberculosis and bronchogenic carcinoma are being encountered with increasing frequency. This is due to two factors: (1) The distribution of active pulmonary tuberculosis is moving constantly toward the older age groups. (2) Carcinoma of the lung is increasing in frequency, now constituting at least 10 per cent of all malignant tumors. Ten illustrative cases are reported.

In 6 cases the first manifestation of carcinoma was unilateral hilar lymph node enlargement. This is in accord with the findings of Rigler, *et al.* (*Radiology* 59: 683, 1952), who pointed out that this very important sign is commonly overlooked and is usually present before symptoms appear. The problem is not one of diagnosis but of detection. To measure the transverse diameter of the hilus, the authors accept as the medial measuring location a point on a vertical midthoracic line bisecting the horizontal transthoracic diameter at the aortic arch and at the level of the diaphragm. The lateral border of the hilus is considered as the hilar margin farthest from the midline but not including the first branching of each pulmonary artery. Prerequisite for an accurate measurement on the postero-anterior roentgenogram is positioning of the patient without significant rotation. To ascertain that the hilar enlargement is actual and not due to projection of a pulmonary lesion at this level, as from the superior segment of the lower lobe, a lateral view is needed.

Obliteration of the medial aspect of the pulmonary artery does not increase the transverse diameter of the hilus but gives an "appearance of solidity," as Rigler points out. An enlarging hilus, demonstrated roentgen-

ographically, is significant, no matter what the absolute transverse diameter may be. It is abnormal for a hilus which measured 4.0 cm. to become 6.0 cm. in diameter, in spite of the fact that for another person a 6.0 cm. hilus may be normal.

Conditions other than carcinoma can produce unilateral adenopathy, although these conditions are not frequent in older age groups. If hilar adenopathy is detected, then other more accurate diagnostic procedures, such as laminagraphy, bronchography, bronchoscopy, and cytologic studies, may be carried out. A hilus greater than 5.5 cm. in diameter is suspicious and one above 7.0 cm. should be considered abnormal and further evaluated. A difference of more than 2.0 cm. between the two hili should also be considered abnormal.

In some instances where hilar adenopathy is not present, the first manifestation of carcinoma may be the appearance of a pulmonary infiltrate near to or remote from the tuberculous lesions. Such a lesion within the normally air-containing lung parenchyma is easy to detect. This may persist or increase in spite of the fact that the tuberculosis is improving, cavities are closing, and the sputum is converted to a "negative" status. This should suggest the possibility of a second disease, and cancer should be the first consideration.

The clinical picture of the patient must be weighed also. A unilateral wheeze which the patient did not have originally is significant and indicates a partial bronchial occlusion. Unexpected hemoptysis and blood-streaked sputum require investigation. Weight loss, anemia, and other symptoms which occur while the tuberculous process is improving roentgenographically will arouse the alert physician to the possibility of bronchogenic carcinoma.

Fourteen roentgenograms.

**Bronchogenic Carcinoma Arising in a Lung Cyst. Report of a Case.** S. Brünner. *Acta radiol.* 51: 117-120, February 1959. (University of Copenhagen, Copenhagen, Denmark)

The author reports the development of bronchogenic carcinoma in a pulmonary cyst. The usual complications of a lung cyst are infection and spontaneous pneumothorax. The development of a carcinoma is a rare occurrence.

The patient was a 56-year-old male with a long history of bronchial asthma and emphysema. The cyst, located in the right upper lobe, had been discovered two years prior to admission to the hospital. One year later it had increased in size and was still well defined, but a small zone of soft-tissue density was seen at the interior surface of the lateral wall. There was a small amount of fluid in the lumen. A further marked increase in size occurred in the next eight months and there was thickening of the wall. On admission, the cyst was still fairly well defined from the surroundings by a narrow dense zone. Lobectomy was performed and the patient died two days following operation. Histologic examination showed carcinoma arising from the lateral cyst wall.

The author feels that, since infection is likely to occur sooner or later in most pulmonary cysts, surgical intervention should be considered as a matter of principle in all cases in which local and general conditions permit.

Four roentgenograms.

THEODORE E. KEATS, M.D.  
University of Missouri

**Cystic Lung Lesions from Metastatic Sarcoma.** Neil E. Crow and Byron G. Brogdon. *Am. J. Roentgenol.* 81: 303-304, February 1959. (USAF Hospital, Lackland AFB, Texas)

The authors report a single case of metastatic pulmonary sarcoma in a 20-year-old white male who had undergone an upper thigh amputation for osteogenic sarcoma of the distal femur. Two or three months following operation the patient experienced sudden left lower chest pain of pleuritic nature. A roentgenogram at this time was normal, but within another month several thin-walled cystic lesions, some with fluid levels, were demonstrable in the lower lobes of both lungs. In the ensuing two months new cystic lesions appeared, many of which were surrounded by infiltration. Death occurred six months after the original operation.

This case is of interest because of the initial cystic manifestation of the pulmonary metastases, although subsequently obvious metastatic tumor developed. The authors believe that it may explain the "spontaneous" pneumothorax which has been reported in association with metastatic sarcoma and agree with the contention of Lodmell and Capps (Radiology 52: 88, 1949) that rupture of such tumor-produced cysts or blebs may be responsible for the pneumothorax in such cases.

Four roentgenograms. RICHARD A. ELMER, M.D.  
Atlanta, Ga.

**Pulmonary Infiltration and Fibrosis of Unknown Etiology. The Risk of Developing Active Pulmonary Tuberculosis.** John F. Chace, S. David Rockoff, and Louis P. Hellman. *Arch. Int. Med.* 102: 367-374, September 1958. (Department of the Navy, Bureau of Medicine and Surgery, Washington 25, D. C.)

In order to assess accurately the risk of development of active pulmonary tuberculosis in persons with predominantly noncalcified pulmonary lesions "proved" by clinical study to be "stable" or "inactive," 268 Naval and Marine Corps personnel who were hospitalized and returned to duty in 1951 with a diagnosis of pulmonary infiltration or fibrosis of unknown etiology were followed for three years, 1952-1954. A review of the roentgenograms in these cases revealed pulmonary lesions which were localized and contained little or no calcification. In general, no difference was apparent radiologically between those lesions diagnosed as "infiltration, pulmonary, cause undetermined" and "fibrosis, pulmonary, cause undetermined." Four illustrative cases are presented. The similarity of the results of clinical investigation and the likeness of the radiologic appearance of the lesions suggested that the separation of such cases into diagnoses of "fibrosis" and "infiltration" was an artificial one, and all cases were therefore studied as a single group.

In 16 of the 268 cases active pulmonary tuberculosis developed. In every instance, the active disease involved that region of the lung which had been clinically investigated during the 1951 hospitalization. Two of these cases are reported.

A control group consisting of 493 Naval and Marine personnel who were hospitalized and returned to duty in 1951 with a diagnosis of hemorrhoids were also followed for three years, 1952-1954. In no one of this group did active pulmonary tuberculosis develop.

Analysis of the two groups indicated that the risk of development of active pulmonary tuberculosis in personnel with "stable" or "inactive," predominantly

noncalcified pulmonary lesions was markedly greater than in the comparable control group.

Application of the tuberculosis attack rate of the study group to the U. S. Navy as a whole during the years of the investigation showed the observed number of cases of active pulmonary tuberculosis (1,206) to be less than 2 per cent of the number expected (66,590).

The development of tuberculosis in the study was compared to the relapse rate of selected U. S. Army cases of active pulmonary tuberculosis which had been treated to the arrested stage and returned to duty and was found, in general, to be not very different.

It is concluded that persons in the U. S. Navy, shown by means of present diagnostic methods to have either pulmonary infiltration or fibrosis of unknown etiology, are more likely to have or to develop active pulmonary tuberculosis than is now generally appreciated.

Nine roentgenograms; 4 tables.

**Pulmonary Manifestations in Collagen Diseases.** Charles M. Nice, Jr., A. N. K. Menon, and Leo G. Rigler. *Am. J. Roentgenol.* 81: 264-279, February 1959. (C. M. N., Tulane University School of Medicine, New Orleans 12, La.)

This study of collagen diseases is based on a review of case records, pathologic data, and roentgenograms of 109 patients seen over a fifteen-year period. Polyarteritis nodosa, disseminated lupus erythematosus, scleroderma, dermatomyositis, and rheumatic pneumonitis are included. Cases diagnosed by autopsy or biopsy are considered proved. Other cases were diagnosed clinically.

Significant pathologic lesions were found in the lungs, pleura, or heart in 28 of 34 autopsies in this series. Roentgen signs were demonstrated in these organs in approximately two-thirds of the entire series of 109 patients, including those still living. From this it would seem that, if periodic roentgen examinations were done in all cases until death, signs would appear in the chest during some phase of the disease in over 80 per cent of patients.

In about one-third of this series of 109 patients the roentgenograms of the chest probably did not contribute to the diagnosis at any time. In another one-third, one or two abnormalities in the chest appeared at some phase of the disease process as confirmatory findings which could be considered of help in following the progress of the disease. In the remaining third there was a combination or sequence of roentgen findings which should lead one to suspect a collagen disorder. In this group, with the aid of laboratory findings, roentgenographic changes will contribute to the differentiation of the various types of collagen diseases in about one-fifth of the patients.

Nonspecific cardiac enlargement, pneumonitis and pleural effusion occur with sufficient frequency in all five of these collagen diseases so that they are of little differential diagnostic value. Pericardial involvement associated with pleural effusion, or the presence of atelectasis and pneumonitis, suggests the diagnosis of disseminated lupus erythematosus or rheumatic pneumonitis. Hilar vascular prominence in combination with nodular pulmonary lesions is indicative of polyarteritis nodosa. Interstitial pulmonary fibrosis is common to both scleroderma and dermatomyositis but the presence of small cyst-like shadows makes scleroderma more likely. A dilated aperistaltic esophagus may also be seen in scleroderma.

Selected case reports illustrate how an analysis of various combinations of nonspecific roentgen signs may lead one to suspect a collagen disease and occasionally make a specific diagnosis.

Twenty-three roentgenograms; 3 tables.

RICHARD A. ELMER, M.D.  
Atlanta, Ga.

**Pulmonary Paragonimiasis. An Evaluation of Roentgen Findings in 38 Positive Sputum Patients in an Endemic Area in Thailand.** Romsai Suwanik and Chamlong Harinsuta. *Am. J. Roentgenol.* **81**: 236-244, February 1959. (Siriraj Hospital and Medical School, Dhonburi, Thailand)

Roentgenograms of 38 patients with sputa positive for ova of *P. westermani* from an endemic area of Thailand revealed the presence of lung flukes in 95 per cent. The roentgen findings were of four types: (1) characteristic ring shadows; (2) opacities with poorly defined borders; (3) linear infiltrations; (4) pleural thickening.

The ring shadows represent thin-walled cysts with a crescent-shaped opacity along one side, "resembling a solar eclipse during the corona stage." Usually they were multiple and aggregated, but occasionally a solitary lesion was found. The range in size was from 6 mm. to 4 or 5 cm. in diameter. In some obscure cases, the smaller ring shadows were demonstrated only by laminography. These characteristic shadows were observed in 20 of the 36 positive cases and in an additional 11 cases were present in association with some of the other manifestations of the disease. Frequently associated with the ring shadows was the demonstration of irregular tracts or burrows communicating with the adjacent cysts. On laminograms the lumen of these tracts measured as much as 5 mm. in diameter, compared to the 2 or 3 mm. for the corresponding medium and small bronchi.

Opacities with poorly defined borders were the chief finding in 9 patients and were demonstrated in an additional 9 patients with other major roentgen manifestations. These appeared as a mottling or as nodular shadows of 3 to 4 cm. diameter, usually in the lower and peripheral lung fields. In general, the roentgen picture was suggestive of pneumonitis as found in Loeffler's syndrome, gnathostomiasis, or ascariasis.

Linear infiltration was the chief manifestation in only 3 patients and pleural thickening in 4. Calcifications were noted in 4 patients.

Eleven roentgenograms; 4 tables.

RICHARD A. ELMER, M.D.  
Atlanta, Ga.

**The Problem of Absorption of Liquids from the Lung—Particularly Bronchographic Contrast Material.** M. Roth. *Fortschr. a. d. Geb. d. Röntgenstrahlen* **89**: 517-527, November 1958. (In German) (Pekářská 53, Brno, Czechoslovakia)

In a search for a nonirritating contrast material for bronchography, the author tried antigen-free plasma as a vehicle for 50 per cent Ultraren Na (known in America as Uroselectan B or Neo-Iopax). Antigen-free plasma is theoretically nonirritating and should be satisfactorily absorbed because it is digestible by the ordinary body enzymes. Three grams of dried plasma were added to 6 c.c. of the medium and experimental studies were made in animals. The phenomenon of osmotic pulmonary edema was immediately encountered and further investigations were directed accordingly.

Hypotonic solutions introduced into a bronchus quickly reach the pulmonary alveoli and, other things being equal, 90 per cent of the material is absorbed in thirty minutes, with no sequelae. Isotonic solutions also travel to the periphery, with absorption of 35 per cent in the same period. With hypertonic solutions, on the other hand, absorption is very slow. Within fifteen minutes of the introduction of a hypertonic salt solution there is a marked increase in the volume of fluid in the lung (164 per cent), because the body fluids immediately act to render the hypertonic solution isotonic. In this process the alveolar membrane serves as a passive physical membrane in the interchange of the fluid. The increase in intra-alveolar and intrabronchial fluid volume produces what is known as osmotic pulmonary edema, which can be rapidly fatal.

In his study of this phenomenon the author injected 2.5 c.c. of a 50 per cent aqueous Neo-Iopax solution into a guinea-pig lung. There was an immediate metallic density outlining the bronchi, such as one would expect from the medium. Two minutes later this density began to fade and a diffuse homogeneous increase in lung opacity developed, reaching a maximum in five minutes. The pulmonary infiltration persisted for approximately six hours and then gradually cleared so that the lung was negative radiographically in twenty hours. The same test was repeated with 2.5 c.c. of 5 per cent salt solution containing no Neo-Iopax. While there was no immediate increase in density, particularly none of a metallic nature, in two minutes a diffuse opacity developed, very similar to that which was superimposed upon the metallic density in the original guinea-pig study. This increased rapidly over the next ten or fifteen minutes, with a pulmonary infiltrate persisting for six hours. Twenty hours later the lung was again clear.

The author concludes that the late densities in the lung following the use of aqueous contrast material are due to osmotic edema and are thus the equivalent of a pneumonic infiltrate. He further believes that at the present time the use of non-antigenic plasma is not warranted and is, in fact, dangerous. The plasma is not a substitute for carboxymethylcellulose.

Twenty-three roentgenograms.

WILLIAM F. WANGNER, M.D.  
Royal Oak, Mich.

## THE HEART AND BLOOD VESSELS

**Rheumatic Heart Disease Associated with Atrial Septal Defect: Clinical and Pathologic Study of 12 Cases of Lutembacher's Syndrome.** J. Espino-Vela. *Am. Heart J.* **57**: 185-202, February 1959. (Department of Congenital Heart Diseases, National Institute of Cardiology, Mexico, D. F.)

Lutembacher's syndrome is a relatively rare condition in which mitral stenosis is associated with atrial septal defect. In the cases reported in the present paper the valve lesions were multiple, and rheumatic heart disease associated with atrial septal defect seems a more appropriate designation. For a diagnosis of Lutembacher's syndrome the auricular defect must be a permanent one, with a free flow of blood (not merely a probe-patent foramen ovale). The most prominent feature is a chronic arteriovenous shunt leading to right heart hypertrophy and pulmonary hypertension. Embryologically the condition appears to be a result of resorption of the septum primum with poor development

ment of the septum secundum. Twelve cases are reviewed in which the diagnosis was established either at operation or at autopsy.

X-ray examination in this series was compatible with rheumatic heart disease in each instance. The pulmonary artery segment was usually prominent; in other cases it formed a large convex contour continuous with the arc of the right ventricle, due probably to clockwise rotation of the heart. The pulmonary branches were usually large and opaque, with increased pulsations, which suggested the diagnosis of atrial septal defect. The left auricle was not invariably enlarged, but the right auricle was always very large. The right ventricle was also enlarged to a greater degree than the left. The aorta was usually normal. Marked cardiomegaly was common.

All of the cases were pathologically proved examples of rheumatic heart disease. The association of the two entities elevates the pulmonary pressure. This results in cyanosis, which clinically suggested the diagnosis of atrial septal defect in 5 of the cases.

Twelve roentgenograms; 5 photographs; 4 electrocardiograms; 3 tables. ROGER M. STOLL, M.D.

New York, N. Y.

**Beriberi Heart Disease.** Reverdy H. Jones, Jr. *Circulation* 19: 275-283, February 1959. (Lewis-Gale Hospital, Roanoke, Va.)

The classical picture of beriberi heart disease is one of right heart failure, rapid circulation time, peripheral vasodilatation, venous engorgement, frequent syncope and shock, and nonspecific cardiac enlargement. This syndrome is seen almost exclusively in the Orient in patients with long standing gross deficiency of vitamin B<sub>1</sub> and responds to administration of thiamine. Usually there are also polyneuritis and pellagra and no other apparent cause of heart failure.

In the Occidental cases rapid circulation is a less common feature and the diagnosis is frequently not entertained. A chest film usually reveals cardiac enlargement with prominence of both the left and right ventricles and pulmonary congestion. On fluoroscopy, cardiac pulsations can be readily distinguished and the cardiac shadow may be differentiated from pericardial effusion. Pleural effusion is not uncommon.

Two cases are reported, one in an alcoholic with dietary deficiency of vitamin B<sub>1</sub> as the sole etiology. The other patient had rheumatic mitral valvular heart disease but did not respond to digitalization and diuretics until thiamine was added.

The author believes that vitamin B<sub>1</sub> deficiency should be considered in any case of cardiac failure refractory to ordinary measures or where a deficient dietary history is obtained. Thiamine should be given as soon as possible, when indicated, since it may be life-saving.

Eight roentgenograms; 3 electrocardiograms; 1 table. ZAC F. ENDRESS, M.D.

Pontiac, Mich.

**Postoperative Myxedema Cardiopathy: an Unusual Instance Which Developed in the Immediate Postoperative Period. Case Report and Review of the Literature.** F. G. Hoffman. *Am. Heart J.* 57: 463-469, March 1959. (VA Hospital, Columbia, S. C.)

The basis for the enlarged cardiac silhouette in myxedema has been a subject of controversy. Some authorities feel that it is due to pericardial effusion, and others

that it is attributable to involvement of the entire myocardium. White (Heart Disease. New York, Macmillan Co., 4th ed., 1951) thinks that three factors are involved: (1) dilatation, (2) increase in the "bulk" of the heart muscle, (3) pericardial effusion. Congestive failure is usually not seen in this condition.

A case is reported in which the cardiac silhouette was found to be enlarged ten days following thyroidectomy in an apparently euthyroid patient. On admission she was found to have an enlarged thyroid, and a chest film indicated that the heart was not enlarged. Thyroidectomy was performed. Two weeks later the patient complained of chest pain and abdominal discomfort. Roentgenography now demonstrated a definite increase in the transverse diameter of the heart. Cardiac fluoroscopy showed a globular cardiac silhouette with decreased pulsations. Treatment with desiccated thyroid was instituted, and a decrease in the size of the heart was seen after nineteen days of therapy. One week later the heart was normal in size.

As a rule, hypothyroidism will not occur postoperatively before the second or third month. Usually in these cases there is underlying heart disease.

Three roentgenograms, with accompanying electrocardiograms.

ROGER M. STOLL, M.D.

New York, N. Y.

**A Roentgenkymographic Sign of the Gastrocardiac Syndrome of Römhild.** H. Grasser. *Fortschr. a. d. Geb. d. Röntgenstrahlen* 89: 558-560, November 1958. (In German) (Ungererstr. 84/0, Munich 23, Germany)

Every radiologist has observed patients with pyknic habitus, large gastric air bubble, distended splenic flexure, elevated diaphragm, and a transverse position of the heart, but no cardiac symptoms. In such cases the evidence is insufficient for the exact diagnosis of Römhild's gastrocardiac syndrome.

Although Römhild stands alone in regarding his syndrome as an entity, it is well known that on occasion gaseous distention of the abdomen can produce cardiac symptoms, an observation dating from the early days of pneumoperitoneum. If the diaphragm is pushed too high, the heart and lungs have too little room and symptoms may result. Under these circumstances, according to the author, Römhild's gastrocardiac syndrome may result. To support this view, he presents roentgenkymograms showing a peculiarity of pulsation in the left border of the heart. This he designates the "drum symptom" (*Paukensymptom*), a term derived from the resemblance of the kymographic curves, when viewed from the side, to a snare drum.

Five kymograms. WILLIAM F. WANGNER, M.D.

Royal Oak, Mich.

**Congenital Aneurysms of the Coronary Arteries with Report of a Case.** Ira Gore, John Smith, and Robert Clancy. *Circulation* 19: 221-227, February 1959. (VA Hospital, West Roxbury, Mass.)

A single case of congenital coronary artery aneurysm is reported, having the distinction of being the first of the 21 in the literature to have been seen (but not recognized) antemortem. A lateral Bucky film of the chest made a year before death had shown an ovoid area of calcification anteriorly near the base of the pulmonary conus. It was interpreted as atypical pericardial calcification.

The patient had experienced anginal symptoms for two years before the final coronary thrombosis at the

age of twenty-six. At autopsy both branches of the left and the trunk of the right coronary artery showed diffuse aneurysmal dilatation, with the lumen nearly obliterated by laminated clot.

One roentgenogram; 1 photomicrograph; 2 photographs; 2 tables. ZAC F. ENDRESS, M.D. Pontiac, Mich.

**Hypoplasia of the Aorta: Report of a Case.** Kalevi Pyörälä, Per-Erik Heikel, and Pentti I. Halonen. *Am. Heart J.* 57: 289-297, February 1959. (Hospital of the Wihuri Research Institute, Helsinki, Finland)

Hypoplasia of the aorta is an anomaly in which the arterial vessels in the greater circulation remain abnormally small. It is not unusual to find this condition as a coexisting anomaly in congenital cardiovascular disease. It is often associated with coarctation of the aorta. Left ventricular hypertrophy is the most frequent autopsy finding. Occasionally right ventricular hypertrophy is observed. Angiocardiography and aortography are the most exact means of establishing the diagnosis.

The authors report the case of a six-year-old boy in whom the diagnosis was made by catheterization and angiocardiography. The child was weak, and mental development was retarded. X-ray examination showed absence of the aortic knob. Aortic coarctation was suspected because of a higher systolic pressure in the arms than in the legs. Angiocardiography was performed, and the left ventricle was found to be dilated. The whole aorta was hypoplastic, its diameter being only 8 mm.

Autopsy findings in these cases suggest that hypoplasia of the aorta causes left ventricular strain with resulting failure, which is then followed by passive pulmonary hypertension and right ventricular enlargement. The diagnosis should be considered in cases of cardiac failure in young people without other apparent cause.

Three roentgenograms; 1 phonocardiogram; 1 electrocardiogram. ROGER M. STOLL, M.D. New York, N. Y.

**Contrast Visualization of the Venae Cavae in Management of Lymphoma.** Billy P. Sammons, Ronald R. Lund, William O. Pischnotte, and Charles Gartenlaub. *J.A.M.A.* 169: 704-706, Feb. 14, 1959. (U. S. Naval Hospital, St. Albans, N. Y.)

For demonstration of the inferior vena cava a 17-gauge needle is inserted percutaneously into the right femoral vein and 30 c.c. of a 50 per cent solution of Hypaque is injected rapidly. With the first injection a transabdominal lateral film of the abdomen is obtained. A second similar injection is followed by anteroposterior filming of the abdomen, which demonstrates the inferior vena cava as well as the urinary tracts. For superior vena caval visualization, 30 c.c. of 50 per cent Hypaque is injected as rapidly as possible into an antecubital vein through an 18-gauge needle. A single supine film of the chest is exposed near the end of the injection by a Bucky grid technic. A second film, six seconds later, allows further evaluation of obstruction and/or collateral circulation. Pyelography is also carried out as part of the procedure. The authors report no significant morbidity in over 200 examinations thus performed.

Forty cases of malignant lymphoma have been investigated by these techniques in addition to the usual

routine studies. In one-fourth of the cases unexpected retroperitoneal involvement was demonstrable. In other instances a more exact evaluation of the extent of known intrathoracic or intra-abdominal disease was obtained, allowing a more enlightened therapeutic approach. A further use of the technic is in evaluation of response to treatment. Occasionally cavo-grams will disclose accurately early recurrence of disease or involvement of new areas in patients already under treatment.

Ten small illustrative roentgenograms are included. JAMES W. BARBER, M.D. Cheyenne, Wyo.

**High Pressure Patent Ductus Arteriosus. A Report of Three Cases.** Jerome Harold Kay, Robert M. Anderson, John E. Meihaus, and Reuben Lewis. *California Med.* 90: 164-166, February 1959. (2212 W. Third St., Los Angeles 57, Calif.)

In some patients with patent ductus arteriosus a very pronounced pulmonary hypertension is present, with pressures in the pulmonary circulation as high, or nearly as high, as in the systemic circulation. In such cases differential diagnosis with exact identification of the lesion may not be readily accomplished so that cardiac catheterization becomes necessary. At times it may be impossible even with catheterization to distinguish precisely between ventricular septal defect, aortic septal defect, and patent ductus arteriosus. In 1 of 3 cases recorded here, it was necessary to resort to retrograde aortography and rapid serial filming for contrast demonstration of the patent ductus.

Three case histories are presented in moderate detail. In each instance a large-caliber patent ductus was successfully ligated, with a good result.

Three surgical diagrams.

JAMES W. BARBER, M.D. Cheyenne, Wyo.

**Roentgen Diagnosis of Anomalous Pulmonary Venous Drainage of Right Lung into Inferior Vena Cava. Report of Three New Cases.** Israel Steinberg. *Am. J. Roentgenol.* 81: 280-289, February 1959. (New York Hospital, New York, N. Y.)

The purpose of this paper is to report 3 new cases of anomalous pulmonary venous drainage of the right lung into the inferior vena cava, each with an unusual feature; to review 9 cases studied by the author; and to re-emphasize the importance of roentgenography in diagnosis.

Associated with the anomalous pulmonary venous drainage in the first patient, a fifty-five-year-old woman, was a huge left diaphragmatic hernia causing dyspnea. Angiocardiography revealed an anomalous right pulmonary vein entering the inferior vena cava. Cardiac catheterization showed an intact atrial septum. The hernia was surgically repaired and symptoms disappeared.

The second patient, a ten-year-old girl, had an unusually high immobile right diaphragm and coarctation of the aorta. Angiocardiography, performed in order to visualize aortic coarctation, revealed an unsuspected pulmonary venous channel draining into the inferior vena cava. Exploratory thoracotomy confirmed the roentgen findings.

The third patient, an asymptomatic fifty-year-old man, was found to have roentgen features characteristic of the anomaly. However, electrocardiography

demonstrated overloading of the right ventricle, an enlarged pulmonary artery, and a plethoric left lung that suggested an atrial septal defect. Serial angiography disclosed enlargement and slight dextroversion of the right atrium, ventricle, and pulmonary artery. The right pulmonary artery was smaller than the left, with crowding and distortion of the pulmonary arterial circulation of the right lower lung. When the left heart structures were visualized a large multiple branching pulmonary vein was seen along the right cardiac border, proceeding into the inferior vena cava.

When dyspnea and bronchopulmonary disease are present in patients with anomalous drainage of the right lung into the inferior vena cava, abdominal aortic branches inserting into the right lower lobe should be suspected. Right pneumonectomy in such cases has been curative.

Conventional frontal roentgenograms of the chest often disclose the characteristic features of anomalous pulmonary venous drainage of the right lung into the inferior vena cava. This is manifest by a characteristic multiple branching vessel increasing in breadth from above downward to merge into a broad crescentic channel adjacent to the right cardiac border. Often the right lung is hypoplastic. In contrast the left lung appears well vascularized, even plethoric, and may be larger than its mate. The right atrium, because of increased blood flow, is unduly prominent; it may extend well into the right hemithorax as a result of displacement of the heart by the enlarged left lung.

Asymptomatic patients with partial anomalous drainage of the right lung into the inferior vena cava do not require treatment, this type of anomaly being compatible with long life. However, patients with dyspnea, recurrent pulmonary infections, and plethora of the lungs may have an associated cardiac lesion, such as an atrial septal defect, that requires repair.

Angiography establishes the definitive diagnosis by clearly demonstrating the anomalous right pulmonary vein plunging below the diaphragm at the cardiohepatic angle. Re-opacification of the right atrium, ventricle, and pulmonary arterial system confirms the existence of the left-right cardiac shunt.

Eleven roentgenograms.

RICHARD A. ELMER, M.D.  
Atlanta, Ga.

**Varicosity of the Pulmonary Vein.** B. Gimes and F. Horváth. *Fortschr. a. d. Geb. d. Röntgenstrahlen* 89: 545-548, November 1958. (In German) (Röntgenklinik der medizinischen Universität Budapest, Hungary)

Varicosity of the pulmonary vein was found in a 34-year-old male with chest pain, referred for tomography to determine the activity of what was thought to be tuberculous infiltration in the left upper lobe. The diagnosis of a varix of the pulmonary vein was made on the basis of the opacities in the routine chest film; tomography showed continuity with the hilus and no evidence of cavitation. There was a decrease in size of the vessel with the Valsalva maneuver, and spot angiography demonstrated filling of the vein with the contrast medium.

Varix of the pulmonary vein is a rare condition, although it was noted at autopsy as early as 1843. It may be accompanied by varices elsewhere in the body. Usually there are no symptoms, but chest pain, hemoptysis, and cyanosis have been reported. Death due

to massive hemorrhage is known to have occurred. Three roentgenograms.

WILLIAM F. WANGNER, M.D.  
Royal Oak, Mich.

**Old Massive Pulmonary Embolism.** H. U. Zollinger and L. Hensler. *Schweiz. med. Wochenschr.* 88: 1227-1233, Dec. 6, 1958. (In German) (Pathologische Institut und medizinische Klinik des Kantonsspitals, St. Gallen, Switzerland)

The authors describe the clinical and anatomical findings of old massive pulmonary embolism as observed clinically in 14 patients, and at autopsy in 68 cases. The first group comprised 9 men and 5 women with an age range of thirty-seven to eighty-five years.

The main clinical symptom is a slowly increasing pulmonary hypertension leading to hypertrophy and finally to insufficiency of the right heart. The radiograph of the chest shows a typical prominence of one or both pulmonary arteries. In differential diagnosis a thrombosis of the pulmonary artery, a congenital heart lesion, an acute pulmonary infarct, bronchogenic carcinoma, and other conditions must be considered.

Clinical signs are present only when the pulmonary blood flow decreases to less than one-third of the normal. The anatomical structure of the occluding masses proves that they are definite embolisms and not primary thrombi. A rather frequent complication, however, is a secondary thrombus formation.

The condition is not rare, affecting elderly patients for the most part. The right pulmonary artery is far more often involved than the left or the main trunk.

The importance of early recognition of an old massive pulmonary embolism is stressed, especially in view of recent experiments undertaken to prove the feasibility of surgical therapy of pulmonary artery disease. An attempt has been made to remove the old embolus or thrombus and even to replace the pulmonary artery by a vascular transplant, in order to prevent development of hypertrophy and insufficiency of the right heart.

Four cases are reported in detail.

Four roentgenograms; 8 photomicrographs; 4 photographs; 1 diagram. HERBERT POLLACK, M.D.  
Chicago, Ill.

**Angiography in Soft Tissue Hemangiomas.** Osborne Bartley and Ingmar Wickbom. *Acta radiol.* 51: 81-94, February 1959. (Sahlgrenska Sjukhuset, Gothenburg, Sweden)

The authors report 8 cases of deeply situated soft-tissue hemangiomas which were examined by angiography. Arteriography was performed, as a rule, by means of a percutaneously inserted polythene catheter, approximately 10 c.c. of Umbradil 35 per cent or Hypaque 45 per cent being injected. In 2 cases in which the tumor was not filled by this technic, injection was made directly into the hemangioma, with the same media in the same amount.

Six of the cases were cavernous or venous hemangiomas and in these the angiographic appearance was considered to be diagnostic. These lesions show wide vascular channels or lakes which are contrast-filled in a late phase and remain so for a considerable time. This does not occur in any tumors other than the cavernous or venous hemangiomas, except possibly in the rare malignant type. Arteriovenous aneurysms may show a similar appearance, but the circulation is more rapid and the afferent and efferent vessels are widened.

In the remaining 2 cases, which histologically were mixed angiomas, the arteriographic appearances were typical, with very small, tightly packed vessels with tortuous feeding arteries, but presumably other tumors rich in capillaries might show a similar picture.

The irregular angio-architecture in malignant soft-tissue tumors is such, as a rule, that these tumors should not be difficult to differentiate from angiomas. In the authors' experience, malignant tumors and inflammatory lesions have not presented the same angiographic picture as the angiomas.

Eighteen roentgenograms; 4 photomicrographs.

THEODORE E. KEATS, M.D.  
University of Missouri

**Intra-Osseous Venography in Portal Hypertension.** Franz P. Lessmann and Robert Schobinger. *Acta radiol.* 51: 95-104, February 1959. (Roswell Park Memorial Institute, Buffalo, N. Y.)

Intra-osseous venography was used in a radiologic study of the collateral venous system in portal hypertension. The procedure was carried out in 25 cases. The contrast material is injected into the medullary cavity of one of the lower ribs on the left and occasionally also on the right side. Approximately 10 c.c. of 50 per cent Hypaque is used, and two or three films are obtained after the injection is completed.

Twelve patients without evidence of liver disease were examined, as well as 5 with a diagnosis of hepatitis, and 8 with a clinical and histologic diagnosis of cirrhosis of the liver.

In subjects without evidence of liver disease, the contrast medium passes from the injection site in the rib through the intercostal vein into the azygos or hemiazygos veins. Occasionally, an adjacent intercostal vein is demonstrated through a subcostal channel. In hepatitis, the findings are similar.

In patients with histologically diagnosed cirrhosis of the liver either with or without radiologic evidence of esophageal varices, the intra-osseous method revealed the vertebral plexus, with delayed filling of the azygos or hemiazygos veins. In addition, a fine network of smaller veins surrounding the intervertebral and intercostal veins was found. In 3 cases, greater vessels were demonstrated in the abdominal cavity, such as the splenic, right gastroepiploic, and left phrenic veins. It was not found possible to demonstrate the submucosal plexus or the paraesophageal trunk of the esophagus.

The results of these examinations do not permit conclusions regarding the diagnostic value of the procedure, but present experience indicates that intra-osseous venography may be an additional implement in the diagnostic evaluation of portal hypertension.

Seven roentgenograms; 1 diagram.

THEODORE E. KEATS, M.D.  
University of Missouri

#### THE DIGESTIVE SYSTEM

**Dynamic Changes of the Varicose Esophagus. A Cineradiographic Study with the Image Intensifier.** L. Ciarpaglini and G. Iannaccone. *Fortschr. a. d. Geb. d. Röntgenstrahlen* 89: 551-557, November 1958. (In German) (Istituto di radiologia dell'Università-Policlinico, Rome, Italy)

The moth-eaten irregular appearance of the varicose esophagus can readily be demonstrated on roentgen

examination with barium sulfate as a contrast material. Fluoroscopically one can see the variation in the appearance of the varices under the influence of tonic and atomic phases of peristalsis. Motion pictures permit the recording of these events and their study at leisure.

In 11 cases in which esophageal varices had been diagnosed from conventional films, cineradiographic views were obtained, frequently illustrating phases difficult to observe otherwise. Incomplete esophageal emptying was demonstrated with residual barium trapped in the pockets between the varices. In some patients there was a general atony of the esophagus between the peristaltic waves, producing a slight resemblance to megaesophagus. Rippling peristalsis can also be well shown by this newer method. The authors note that the respiratory phase has little to do with the size of the varices and they could find no practical use for either the Valsalva or Müller test.

Forty-five roentgenograms.

WILLIAM F. WANGNER, M.D.  
Royal Oak, Mich.

**The Meaning of a Gas Bubble Projected Above the Level of the Diaphragm.** E. Koppenstein. *Fortschr. a. d. Geb. d. Röntgenstrahlen* 89: 569-572, November 1958. (In German) (Uzsoki u. 29-35, Budapest 14, Hungary)

Chest films which demonstrate a bubble of gas above the level of the diaphragm in the region of the stomach or the left flexure of the colon raise the question of a possible hiatal hernia, phrenic hernia, or, rarely, epiphrenic diverticulum. This gas projection is a common finding, and it is easily determined by fluoroscopy whether or not an abnormality is present. The explanation of the phenomenon, however, is not too well known. It is due to the fact that the left leaf of the diaphragm, like the right, has a double cupola. Those individuals in whom the thoracic type of breathing predominates show paradoxical movement of one-half of the cupola on deep inspiration. At the greatest depth of inspiration, the anterior arch of the left leaf of the diaphragm rises instead of falls. If there is gas under this portion of the diaphragm it will, of course, project above the main level. The best term for this is pseudo-paradoxical respiratory motion.

Four roentgenograms; 1 diagram.

WILLIAM F. WANGNER, M.D.  
Royal Oak, Mich.

**Acute Gastric and Duodenal Ulceration Following Endothoracic Surgery.** G. Rotthoff and H. Vieten. *Fortschr. a. d. Geb. d. Röntgenstrahlen* 89: 561-565, November 1958. (In German) (H. V., Moorenstr. 5, Düsseldorf, Germany)

The authors report 29 cases in which acute gastric or duodenal ulceration followed thoracic surgery. Four of these patients died and in 3 of these autopsy showed the cause of death to have been hemorrhage from the upper gastrointestinal tract.

The ulcers tend to occur in the first two postoperative weeks and definitely predominate in childhood. There is a very high correlation with cardiac surgery but none with the thoracotomy itself. Twenty-seven of the authors' 29 patients were operated upon for diseases of the heart and great vessels and 2 for lung ailments. More than half the patients were under fifteen years of age. There seemed to be no correlation of ulcer development with the type of anesthesia, with the length

material, the ap-  
nic and  
ture.  
d been  
graphic  
phageal  
barium  
in some  
phagus  
ight re-  
sis can  
authors  
th the  
al use

or difficulty of the surgery, or with the specific cardiac anomaly. Some connection appears possible, however, with the use of hypothermia both on an actual and a theoretic basis. The authors feel that the main cause of the formation of ulcers lies in manipulation with resultant stimulation of the vagus nerve in the region of the heart and great vessels. Recovery is usually prompt.

Five roentgenograms.

WILLIAM F. WANGNER, M.D.  
Royal Oak, Mich.

**Hyperplasia of Brunner's Glands.** Maurice L. van der Reis, Leo van der Reis, and B. Vicas. California Med. 90: 162-164, February 1959. (2515 Ocean Ave., San Francisco 27, Calif.)

Clinical and radiologic findings in hyperplasia of Brunner's glands are briefly reviewed and an illustrative case is reported. Characteristically the radiographic findings consist of multiple, discrete, small, oval, or rounded filling defects in the first and second portions of the duodenum. These defects in most cases appear to be sessile. They are most numerous in the duodenal bulb, where they produce a so-called "Swiss cheese pattern." The walls of the duodenum remain flexible, and usually there is little associated spasm or irritability. In radiological differential diagnosis one must consider adenoma of the duodenum as well as some other rarer benign tumors. The differential points include, for adenoma, the demonstration of stalks or pedicles and frequently the presence of polyps in other portions of the small bowel. Achlorhydria is frequent with duodenal polyps while gastric hyperacidity is characteristic of hyperplasia of Brunner's glands. Nonspecific duodenitis appears to be the only inflammatory condition capable of simulating hyperplasia of Brunner's glands. With duodenitis, associated findings include irritability of the bulb with or without spasm, inconstancy in size and shape of the small, rounded filling defects, obliteration of the pattern on manual compression, and a regression of the findings on anti-ulcer management. Proper treatment appears to be conservative, with diet, antacids, and anticholinergic drugs. In the case reported complete relief was obtained on such a program.

Two roentgenograms. JAMES W. BARBER, M.D.  
Cheyenne, Wyo.

**Interposition of a Loop of Ileum Between the Dome of Diaphragm and Liver.** M. G. Varadarajan. Punjab M. J. 7: 343-350, April 1958. (68, Egmore High Road, Madras 8, India)

The author reports a case in which a loop of the ileum was interposed between the right dome of the diaphragm and the superior surface of the liver. The patient was a 37-year-old man, with pain in the right hypochondrium of three years duration. On fluoroscopy of the chest a multilocular cystic swelling was visualized beneath the right dome of the diaphragm. The liver shadow was not demonstrable. There were no paradoxical movements of the diaphragm. The right diaphragm was elevated one intercostal space higher than the left; it was thin and slightly stretched. A barium-meal series suggested ulcers involving the lesser curvature of the stomach and the first part of the duodenum, with a fair amount of stasis at twenty-four hours. In the five-hour film, the cecum was visualized and barium was seen going beneath the right dome of the diaphragm; at twenty-four hours barium was present in the loop of small intestine beneath the right diaphragm.

A barium-enema study showed a certain amount of narrowing beyond the hepatic flexure, continuing down the ascending colon and cecum, which were nearer to the midline than usual. A tentative diagnosis was made of peptic ulcers involving the lesser curvature of the stomach and first part of duodenum, giving rise to pyloric obstruction.

At operation, a loop of the terminal ileum was found between the right dome of the diaphragm and superior surface of the liver. For a distance of about 2 feet, beginning 8 inches from the cecum, it was studded with clusters of cysts, densely in some places and sparsely in others. On biopsy these proved to be lymphangiomas. The ileocecal and mesenteric nodes were enlarged. About the middle of the lesser curvature of the moderately dilated stomach was a vascularized area with omental adhesions; this felt rather hard, suggesting a healed gastric ulcer. There was an ulcer in the first part of the duodenum, with dense scarring and adhesions.

Although there is nothing in the history pointing to perforation of a peptic ulcer, from the physical findings and those at operation the author thinks it is evident that the patient recovered from the minor leak from a minimal perforation which resulted in local peritonitis. This was followed by irregular peristalsis, pushing the coils of intestine to the diaphragmatic level, where they were subsequently anchored.

Colonic hepatodiaphragmatic interposition has been frequently reported, but the author believes that this is probably the first case of small intestinal hepatodiaphragmatic interposition to be recorded. Actually Linsman and Chalek presented a case in 1950 (Radiology 54: 726, 1950), and Aiken (New England J. Med. 258: 1192, 1958. Abst. in Radiology 72: 616, 1959) described a case in which there was hepatodiaphragmatic interposition of jejunum, ileum, cecum, and ascending colon with intestinal obstruction.

Nine roentgenograms; 1 photograph.

**A Vascular Study of the Small Intestine.** H. B. Benjamin and A. B. Becker. Surg., Gynec. & Obst. 108: 134-140, February 1959. (Marquette University School of Medicine, Milwaukee, Wisc.)

**New Concept of the Small Intestine Vascular Pattern.** Alan B. Becker and H. B. Benjamin. Rev. canad. de biol. 17: 460-482, December 1958. (Marquette University School of Medicine, Milwaukee, Wisc.)

The material reported in these two papers is the same. The authors studied the arterial patterns of the small intestine of dogs and man.—i.e., the area between the duodenjejunal flexure and the ileocecal junction—by injecting the superior mesenteric artery with radiopaque material and radiographing the infused bowel segments, or paraffin sections, with grenz rays and roentgen rays. Grenz rays lie between the usual roentgen rays and ultraviolet rays and as a result have a shallow penetrating power found useful in the study of the finer ramifications of the intramural vessels. Bismuth oxychloride was found to be an ideal radiopaque material because its particulate size was such that it stopped at the capillary bed on the arterial side, thus limiting the study to the arterial side of the vascular tree. Diodrast was also used.

The grenz-ray photographs, magnified, were very useful in the study of even minute intramural vessels. The superior mesenteric artery divides into 10 to 16

intestinal arteries which bifurcate distally in such a way as to form intestinal arcades from which arise the vasa recti vessels that directly supply the small intestine. There has been disagreement in the standard anatomical texts about the intramural paths and anastomoses of these vasa recti branches. The authors were able to study these vessels and determine their patterns.

The vasa recti were seen to bifurcate on the mesenteric portion of the bowel and then penetrate the wall to the submucosal layer, where a branch runs around each side of the bowel to give a signet ring appearance. The terminal portions of the intramural vessels anastomose on the antimesenteric border, completing the ring. Abundant anastomoses occur throughout the circumference of the ring with adjacent intramural vessels. Branches are sent to the mucosal and serosal surfaces. In the dog there are anastomoses between adjacent vasa recti intramesenterically but these are absent in man.

Both of these papers are illustrated by numerous photographs. MORTIMER R. CAMIEL, M.D., Brooklyn, N. Y.

**Incidence of Gall Bladder Disease in "Normal" Men.** Richard S. Wilbur and Robert J. Bolt. *Gastroenterology* 36: 251-255, February 1959. (300 Homer Ave., Palo Alto, Calif.)

The question of when to remove a gallbladder has been debated at great length in the medical literature and there is much controversy about the surgical indications. The advent of cholecystography has resulted in the discovery of more cases of "silent gallstones" and has intensified the argument.

To decide upon the advisability of surgery in the presence of stones, three factors should be known: (1) the true incidence of biliary calculi in the general population; (2) the percentage of patients harboring calculi who are asymptomatic; (3) the natural course of this asymptomatic group if not operated upon.

An opportunity for obtaining light on the first two of these points was afforded by a group of 1,234 executives who were asymptomatic, a cholecystographic survey having been taken as part of their routine annual examinations in the last ten years. The results were grouped in three classifications: (1) faint visualization, (2) nonvisualization, (3) stones.

Of these "normal men," 14.6 per cent showed some evidence of gallbladder abnormality past or present, although they averaged less than fifty years of age: previous cholecystectomy 2.0 per cent; faint visualization 3.6 per cent; nonvisualization, 1.6 per cent; biliary calculi, 7.5 per cent.

Furthermore, an unexpected high percentage (70 per cent) of patients with stones had no abdominal symptoms. Of the remaining 30 per cent, two-thirds had only the unreliable symptoms of dyspepsia and epigastric pain, complaints which were also found in 10 per cent of the control group. Of the men with previous cholecystectomy and with no other demonstrated cause for symptoms, 31 per cent still had "gallbladder symptoms."

It follows from this observation that there are millions of "normal" male Americans with "silent gallstones." To eradicate all of these gallstones represents an enormous undertaking, which should not be undertaken. Furthermore, many symptoms that may be present are not related to the stones.

Typical "biliary colic" occurs in only 3.6 per cent of

men with stones and in 0.9 per cent of men with normal cholecystograms. Therefore, cholecystectomy, in the absence of true biliary colic or jaundice, should not be performed for relief of vague indigestion or dyspepsia just because stones have been demonstrated.

The authors promise to report in the future about the natural course of the asymptomatic group with stones demonstrated on cholecystography.

Two tables.

SHAWKI ASMAR, M.D., Cleveland Metropolitan General Hospital

**Radiographic Signs of Acute Suppurative Cholecystitis.** James J. McCort. *California Med.* 90: 139-143, February 1959. (Santa Clara County Hospital, San Jose, Calif.)

A series of 26 pathologically proved cases of acute cholecystitis is reviewed. Preoperative radiographic examination of the abdomen confirmed the presence of an inflammatory process in 17 cases. Routine films of the abdomen made on patients with signs and symptoms indicating infection or tumefaction in the abdomen include anteroposterior supine and upright and left lateral decubitus. Additional studies were performed in some patients if the diagnosis remained obscure. Such studies may include intestinal examinations with barium, intravenous cholangiography, or intravenous pyelography.

The radiographic signs of acute cholecystitis are tabulated, and illustrative roentgenograms are reproduced. Helpful radiographic findings included the following:

1. *Enlargement of the gallbladder* as indicated by separation or alteration in position of opaque calculi or indentation of adjacent bowel, particularly the colon.

2. *Findings indicative of localized peritoneal irritation*, including ileus of the descending duodenum or hepatic flexure of the colon. More severe degrees of inflammation produce edema of the adjacent bowel wall manifested occasionally by effacement of colonic haustra in the hepatic flexure or obliteration of valvulae conniventes of the duodenum. Similarly produced edema may result in obliteration of the fat line marking the inferior border of the liver.

3. *Early perforation* of the gallbladder, which may be manifested by small bubbles of gas trapped in the gallbladder bed. Perforation of the gallbladder into the general peritoneal cavity will produce progressive signs of adynamic ileus, intraperitoneal fluid, subdiaphragmatic abscess, and occasionally plate atelectasis at the base of the right lung.

4. A few patients may show *cholecystitis emphysematosa* as a result of gas-producing bacterial infection within the gallbladder wall.

It is noted that any of these findings may be shown in acute pancreatitis, and a differential diagnosis may at times be impossible by radiographic means; laboratory studies will frequently help. The diagnostic points under discussion are unusually well demonstrated by carefully chosen roentgenograms, with brief accounts of the clinical and laboratory findings in the cases illustrated.

JAMES W. BARBER, M.D., Cheyenne, Wyo.

**Vicarious Calcification Involving the Gallbladder.** Carleton M. Cornell and Robert Clarke. *Ann. Surg.* 149: 267-272, February 1959. (Bellevue Hospital, New York, N. Y.)

The authors have described and reviewed the condi-

tion of gallbladder calcification, variously designated calcifying cholecystitis or china or porcelain gallbladder. Some 50 cases have been reported since the first description in 1797. At Bellevue Hospital 16 cases were found in 4,271 cholecystectomies from 1922 through 1956.

Signs and symptoms are subtle, indicating only a vague biliary dysfunction. Their duration ranges from several weeks to ten years, seldom including any acute episodes. Diagnosis is by radiography. Since the gallbladder is nonfunctioning, the plain radiograph is the key procedure. To be differentiated are hepatic abscesses, hydatid cysts, kidney calculi, costal cartilages, and appendiceal mucocoeles.

Routine blood and chemical studies are unrevealing except with common bile duct obstruction, when alkaline phosphatase will be elevated.

Both the pathogenesis and pathology of gallbladder calcification are discussed, indicating the existence of a basic degenerative change followed by vicarious calcification of the dystrophic type. The calcified viscus is usually large, stony-hard, with a cartilage-like wall impregnated with calcium. Numerous calculi, including cystic duct stones, are found. Calcification of the gallbladder represents complete loss of function with total morphologic change. Carcinoma frequently supervenes.

Two case histories are presented. Two roentgenograms; 2 photomicrographs; 3 photographs.

JOHN C. POWERS, M.D.  
St. Vincent's Hospital, New York

**The Fatty Meal in Oral Cholecystography. A Re-evaluation, with Comments on "Tumors" of the Gallbladder, and on Its Rokitansky-Aschoff Sinuses.** Christian V. Cimmino. *Am. J. Digest. Dis.* 4: 159-170, February 1959. (Mary Washington Hospital, Fredericksburg, Va.)

Review was made of 188 gallbladder studies with Telepaque in an attempt to answer two questions: (1) Does the fatty meal contribute morphologic information (such as demonstration of filling defects) not visualized on pre-fat studies? (2) Does the fatty meal contribute useful functional information not available from the pre-fat study?

The author's morphologic observations are summarized as follows: "The post-fat film *per se* contributed little to the diagnosis of stones. However, it was of value in 1 per cent of the cases in demonstrating noncalculous filling defects in the upper half of the gallbladder and not in the lower half, by virtue of the increase in density of this segment. . . . The single patient in whom Rokitansky-Aschoff sinuses were demonstrated showed that these may be obscured by a fatty meal and that their x-ray visualization may be intermittent."

The author feels that diagnostic accuracy is best served by limiting the radiologic description to "simple filling defects." The radiologist cannot differentiate safely between true neoplastic papillomas on the one hand, and inflammatory excrescences, adenomyosis, or occasional rare mesenchymal growths on the other hand. Demonstration of any of these entities may be enhanced on post-fat meal films, but it is the author's opinion that good quality pre-fat meal films will demonstrate the majority of such lesions.

As a criterion of gallbladder function, the response to fat meal stimulus is not reliable. The fatty meal is of

no use in the nonvisualized gallbladder. It is of little or no value in enhancing the density of contrast media to a point where stones can be excluded in cases of poor concentration. "The roentgenological criteria for biliary dyskinesia are still too indeterminate to be of practical use."

It is concluded that the fat meal is not to be recommended as a routine procedure but that in patients with gravitational suboptimal density in the gallbladder infundibulum and in the unusual case of suboptimal concentration without demonstration of stones in spite of repeated studies, contrast demonstration may be enhanced. "Under these conditions, about one-third of the examinations will require the fatty meal."

The multiple small roentgenograms illustrating the paper are not very helpful in demonstrating the minute morphologic points under discussion, probably because of loss of contrast resulting from reproduction.

Eleven roentgenograms.

JAMES W. BARBER, M.D.  
Cheyenne, Wyo.

**Side-Effects of Biligrafin Forte.** Georg-Fredrik Saltzman. *Acta radiol.* 51: 121-127, February 1959. (Serafimerlasarettet, Stockholm, Sweden)

The author studied the frequency and nature of side-effects of Biligrafin Forte (a 50 per cent solution of a methylglucamine salt) in a series of 271 biliary tract examinations and reached the following conclusions:

1. The frequency of side-effects of Biligrafin Forte is considerably higher than for Biligrafin in the form of a sodium salt. The quality of the side-effects seems to be mainly the same for both preparations. It may differ between different examinations in the same patient.
2. The frequency of side-effects is somewhat higher in women than in men.
3. The frequency of side-effects decreases with age in adult patients.

4. Patients with jaundice have no side-effects.
5. The injection speed does not influence the side-effects, either in quantity or quality.
6. The amount of the contrast medium injected does not, within diagnostically practicable limits, influence the quantity or quality of the side-effects.

THEODORE E. KEATS, M.D.  
University of Missouri

## THE MUSCULOSKELETAL SYSTEM

**A Comparative Radiological Study of Reiter's Disease, Rheumatoid Arthritis and Ankylosing Spondylitis.** R. M. Mason, R. S. Murray, J. K. Oates, and A. C. Young. *J. Bone & Joint Surg.* 41-B: 137-148, February 1959. (London Hospital, London, E. 1, England).

The radiologic changes observed in Reiter's syndrome (nongonococcal urethritis, polyarthritis, and conjunctivitis) have been previously described (Murray, Oates, and Young: *J. Fac. Radiologists* 9: 37, 1958. *Abst. in Radiology* 71: 778, 1958). The present report concerns the radiologic differentiation of the syndrome from rheumatoid arthritis and ankylosing spondylitis. For this purpose a comparative study was made of radiographs of the hands, feet, ankles, and pelvis of 25 patients with Reiter's disease, 81 with rheumatoid arthritis, and 38 with ankylosing spondylitis.

No absolute means of differentiating the conditions radiologically in all cases was found. Some points, however, are felt to be helpful. In Reiter's disease the

changes are predominantly in the feet and sacroiliac joints with destructive joint changes and deformity. In addition exuberant periosteal new bone formation tends to occur at the calcaneus. Asymmetrical bone and joint involvement is characteristic. Osteoporosis is not common.

In rheumatoid arthritis joint changes tend to be symmetrical; they are accompanied by osteoporosis and there is equal involvement of hands and feet. The sacroiliac joints are involved infrequently and show only mild changes.

In ankylosing spondylitis changes at the sacroiliac joints are early and pronounced. There is mild involvement of the feet.

A florid periostitis of the calcaneus in Reiter's disease was the most significant radiologic finding in this series and is felt to be pathognomonic of the disease.

Twenty-five roentgenograms; 5 tables.

JOHN F. RIESSE, M.D.  
Springfield, Ohio

**Dysphagia Caused by Hypertrophic Changes in the Cervical Spine. Report of Two Cases.** Oliver H. Beahrs and Herbert W. Schmidt. *Ann. Surg.* 149: 297-299, February 1959. (Mayo Clinic, Rochester, Minn.)

Two cases in which hypertrophic changes in the cervical spine had become large enough to produce dysphagia are reported.

**Case I:** A 52-year-old man gave a nine months history of dysphagia accompanied by burning pain, more pronounced when the neck was extended. Crepitus was observed on motion. Esophagoscopy revealed no evidence of tumor. An esophagram showed "extrinsic pressure on the esophagus in its posterior aspect just below the introitus, probably due to osteophyte." An operation was performed and a spur arising from the anterior portion of the bodies of C-4 and C-5 was removed. It measured  $2.5 \times 1.5 \times 1.0$  cm. and weighed 2 gm. There was complete relief of pain and dysphagia.

**Case II:** A 36-year-old male gave a three months history of dysphagia and pain in the neck, right shoulder, and arm. Roentgenograms of the cervical spine revealed marked lippling of the anterior-superior surface of the body of C-5. An esophagram and cervical myelograms were normal. Diagnostic cervical nerve blocks were carried out in stages. Blocks of the superior laryngeal nerve and 4th, 5th, and 6th cranial nerves produced negative results. Block of the stellate ganglion, however, resulted in complete relief of pain. An operation was performed and the bony process of C-5 was identified. It was thought to be a source of irritation to the sympathetic chain on various types of movement of the neck. The bony lip was excised and the sympathetic chain was interrupted. A Horner's syndrome was produced but postoperatively there was complete relief of dysphagia and pain.

Three roentgenograms; 1 photograph.

CAPT. HOWARD R. GOULD, M.C.  
St. Vincent's Hospital, New York

**Bony Bridges Following Transverse Process Fractures of the Lumbar Vertebrae.** C. Esser. *Fortschr. a. d. Geb. d. Röntgenstrahlen* 89: 579-590, November 1958. (In German) (Langenbeckstr. 1, Mainz, Germany)

Bony bridging of the transverse processes is an infrequent but striking roentgen finding. Reports in the literature have been relatively few, and in general

limited to individual case histories. In most instances they have emphasized a developmental origin. With this the author is not in agreement.

A bony bridge of traumatic origin is irregularly broad, spans two or more transverse processes, is usually unilateral, and may be either continuous or with intervening pseudarthroses. Both smooth and irregular bone has been seen, and in some instances the bone becomes well trabeculated, although the general tendency is for an amorphous structure. There appear to be no significant predisposing developmental anomalies of the involved spine and thus far the condition has not been reported in childhood. A slight scoliosis appears to be quite common, but the bone bridge may be either on the convex or the concave side of the curvature.

In view of the frequency of fractured transverse processes, it is amazing that there are not more of these bony bridges seen in the radiography of elderly people. The author reports a case in which there was an injury in 1945, with fracture of the transverse processes. A re-examination in 1958 revealed a strong bony bridge at the site of the previous trauma, though this had not been present earlier. In this instance, as in many others, the ossification outlined the muscle bundle, and thus the condition actually represented a localized myositis ossificans.

Twelve roentgenograms.

WILLIAM F. WANGNER, M.D.  
Royal Oak, Mich.

**Results of Abrodil Myelography in Prolapse of the Lumbar Intervertebral Disk.** C. W. Fassbender, G. Häussler, and H. G. Stössel. *Fortschr. a. d. Geb. d. Röntgenstrahlen* 89: 574-578, November 1958. (In German) (Allgemeine Krankenhaus, Hamburg-Heidelberg, Germany)

Prolapse of an intervertebral disk as a degenerative process is related to age, type of occupation, and vertebral structure. In the neurological examination, the exact level of involvement may be revealed or may be ambiguous. Lumbarization and sacralization of the vertebrae in particular create confusion as to the nerve level.

One of the authors (Häussler) has operated in 950 cases of prolapsed disk since 1938. For the first eleven years operation was done without contrast studies. Between 1949 and 1958, 470 patients were examined by abrodil myelography prior to surgery. Toward the end of this period plain film studies were ignored, since no correlation was found between simple demonstration of a low disk and the level of prolapse. While abrodil is considered the contrast agent of choice, it is not devoid of risk. Headaches frequently follow its use, seizures have resulted, and an occasional death has occurred.

The authors' technic differs from that commonly used in the United States. No fluoroscopy is performed. The day before filming, the patient is tested for abrodil sensitivity by the intracutaneous method. On the day of the examination, lumbar puncture is performed with the patient sitting. Three cubic centimeters of 5 per cent Novocaine is injected directly into the spinal canal and, when anesthesia of the legs appears, the patient is placed on the left side and the table is tilted head up 20°. Ten cubic centimeters of abrodil is then injected and the spinal needle removed. A lateral view is taken. Following this, the patient is placed on the abdomen and a single postero-anterior exposure is made. Two decubitus views are obtained, and the

patient is returned to his room. The contrast medium is not removed.

In the 470 patients, the correlation with the surgical findings was as follows. In 125 cases, there was complete agreement between neurological, surgical, and roentgen findings. In 282 cases, there was complete correlation between the surgical and radiologic findings but questionable neurologic agreement. In 2 patients, a prolapsed disk was suspected neurologically and a deformity was demonstrated on the myelogram but no prolapse could be found surgically. In 8 patients in whom the roentgenogram was positive for a prolapsed disk, surgery demonstrated either scar tissue, an osteophyte, or a slight developmental anomaly. In 27 patients with negative myelograms, disks were shown at surgery. In this group of 27 cases, at least 23 were probably reducible disk herniations, and roentgenograms with the patients in dorsal flexion might have demonstrated the abnormality. Eighteen patients with findings which were clinically confusing showed no disk prolapse on myelography but were nevertheless operated on. All were negative surgically.

At present, the correlation between the x-ray and the surgical diagnosis is 88.6 per cent. This percentage may be slightly vitiated, however, by the fact that only rarely is a roentgenographically positive patient not treated surgically. By the same token, the surgeon is not too inclined to operate upon a patient who is radiographically negative. The correlation between neurologically objective positive findings combined with positive radiography and surgical observation is 97 per cent. A small but significant group of patients, despite this correlation of all three diagnostic modalities, show the same symptoms following surgery as before.

WILLIAM F. WANGNER, M.D.  
Royal Oak, Mich.

**Resolving Scoliosis.** J. C. Scott. *J. Bone & Joint Surg.* 41-B: 105-113, February 1959. (Nuffield Orthopaedic Centre, Oxford, England)

It is generally accepted that, in scoliosis, once a curve with structural changes is present in a growing child, it will increase; that the main prognostic factor is the period of growth that lies ahead of the patient. This, however, is not entirely true. Other factors play a part.

Earlier studies by the author showed a high percentage of infants with a curve of more than 10 degrees at six months with no measurable deformity at eighteen months to two years (*Proc. Roy. Soc. Med.* 49: 398, 1956). See also Scott and Morgan: *J. Bone & Joint Surg.* 37-B: 400, 1955. *Abst. in Radiology* 66: 916, 1956. This resolving type of scoliosis was considered to be a natural alignment of the infantile spine which was corrected by assumption of the erect posture.

Four cases are reported here which illustrate a scoliosis first diagnosed during infancy, with gradual disappearance during the period of active growth. The curve pattern was the same in all four, convex to the left and involving the lower half of the thoracic spine.

Seventeen roentgenograms; 6 charts.

JOHN F. RIESER, M.D.  
Springfield, Ohio

**Dorsal Kyphosis in Chronic Obstructive Lung Disease.** Denis F. J. Halmagyi. *Lancet* 1: 446-448, Feb. 28, 1959. (University Medical School, Sydney, Australia)

Osteoarthritis of the spine was investigated in 300

patients with chronic obstructive lung disease and in 60 persons of comparable age with no respiratory complaints. Both groups consisted of coal miners. The indirect maximal breathing capacity was determined in all patients in Group I and in the last 10 patients in Group II.

Lateral chest roentgenograms were used to measure the spinal curve if they gave a clear picture of the entire spine. Tangents were drawn to the anterior borders of the second and eleventh thoracic intervertebral spaces. The angle facing upwards—called the “kyphotic angle”—was measured with a protractor in 28 patients, twice on two separate films of each patient. The mean kyphotic angle was 46°. In 3 the two measurements differed by 4°; in 5 by 3°; and in the rest by 0-2°. Three measurements on three separate films were made in 13 patients. Their mean kyphotic angle was 49°; in 1 the results differed by 6°; in 2 by 5° and 4° respectively, and in the rest by 0-3°.

Around the age of thirty the angle of kyphosis was about equal in the two groups, but with advancing age miners with diseased chests became more kyphotic than miners with healthy chests. Nonspecific chronic osteoarthritis of the spine was also more common in this group. The author concludes that increased tendency to dorsal kyphosis is probably related to the earlier onset and greater prevalence of chronic osteoarthritis.

The indirect maximum breathing capacity showed a significant negative correlation to the kyphotic angle. Electrocardiographic signs of right ventricular hypertrophy were related to the maximum breathing capacity but not to the degree of kyphosis.

One roentgenogram; 5 graphs.

**Osteoid Osteoma of Vertebrae.** W. T. Mustard and F. W. DuVal. *J. Bone & Joint Surg.* 41-B: 132-136, February 1959. (F. W. DuVal, Winnipeg Children's Hospital, Winnipeg, Man., Canada)

Two case reports of osteoid osteoma of vertebrae are presented. Both patients were young boys seen because of pain and a scoliosis. Radiological examination revealed an area of increased density in the first thoracic vertebra in one instance and a radiolucent defect of the first lumbar vertebra in the other. Both patients were subjected to surgery, the lesions were curetted, and autogenous bone grafts were applied. Histologic study established the diagnosis. Follow-up at six or seven years revealed symptomatic relief and absence of scoliosis.

Reports of only 25 cases of osteoid osteoma of vertebrae were discovered. The noteworthy features of the present cases were the initial complaints of pain and scoliosis, the uncertain radiologic findings, the similar position of both lesions, involving vertebral body, neural arch and articular facet, and the disappearance of pain and scoliosis following removal of the lesions.

Six roentgenograms; 2 photomicrographs.

JOHN F. RIESER, M.D.  
Springfield, Ohio

**Congenital Short Femur. Simple Femoral Hypoplasia.** P. A. Ring. *J. Bone & Joint Surg.* 41-B: 73-79, February 1959. (Hospital for Sick Children, Great Ormond St., London, England)

Defects in femoral development may vary from diminished growth without loss of bony structure to complete or partial absence of the bone. Congenital

coxa vara may be associated with shortening and deformity of the femur. The major group of cases, however, show a simple femoral hypoplasia without coxa vara. Radiographs commonly reveal no abnormality aside from the shortening, but there may be delayed ossification of the capital femoral epiphysis, lateral bowing, and cortical sclerosis of the shaft. Clinically there is a short, bulky thigh held in lateral rotation. The diagnosis can be made at birth. Nineteen cases are reviewed in tabular form.

Simple femoral hypoplasia would appear to be a distinct clinical entity, the result of a defect in endochondral ossification. It is often associated with depression of growth in the tibia and there may be a congenital defect of the fibula. Despite a normal radiographic appearance there is a progressive disturbance of femoral growth throughout the growth period, but the overall shortening of the limb seldom exceeds 3 inches.

Operative procedures are briefly considered. These include lengthening the short femur, shortening the normal femur, a combination of both measures, and epiphyseal stapling in milder cases.

Six roentgenograms; 2 photographs; 1 table.

JOHN F. RIESSE, M.D.  
Springfield, Ohio

**The Effects of Kwashiorkor on the Development of the Bones of the Knee.** P. R. M. Jones and R. F. A. Dean. *J. Pediat.* 54: 176-184, February 1959. (Mulago Hospital, Kampala, Uganda)

Roentgenograms of the knees of 75 African children (44 boys, 31 girls) admitted for treatment of kwashiorkor [a deficiency disease possibly related to pellagra] were compared with those of 47 healthy children of the same age. Thirty of the children with kwashiorkor were re-examined after three to forty months. Retardation in development was found in both sexes. The bones were smaller, less well calcified, and had much less trabecular pattern than those of healthy children. They also showed several abnormalities not present in the normal child: (a) The cortex of the shafts of the femur and tibia was often very thin or almost invisible (in 95 per cent of the boys and 84 per cent of the girls). (b) The zones of provisional calcification in the metaphyses of the femur and tibia could not be clearly seen (in 95 per cent of the boys and 97 per cent of the girls). (c) The concave profiles of the lower part of the femoral shaft and the upper part of the tibial shaft were interrupted by slight but distinct swellings best seen in the anteroposterior view, suggesting fusiform distortion of the shafts (in 57 per cent of both boys and girls). (d) There were dense white lines at the ends of the femoral and tibial metaphyses (in 97 per cent of the boys and 77 per cent of the girls). (e) There was irregularity of the calcification of the edges of the femoral and tibial epiphyses (in 82 per cent of the boys and 77 per cent of the girls).

Transverse lines, indicating past disturbances of growth, were present on the femur or tibia in 84 per cent of the boys and 74 per cent of the girls with kwashiorkor. Only 22 per cent of the healthy boys and 10 per cent of the healthy girls exhibited such lines.

The hands of the same children were also studied roentgenographically. Comparisons suggested, but did not conclusively prove, that the knee may be a more accurate indicator than the hand of the retardation of bone development associated with kwashiorkor. The hands of the children with the disease did not show

the minor anomalies that have been described in other children with nutritive failure.

Two roentgenograms; 2 drawings; 2 graphs; 1 table.

**Experimental Epiphyseal Injury and Freiberg's Disease.** G. T. F. Braddock. *J. Bone & Joint Surg.* 41-B: 154-159, February 1959. (Royal National Orthopaedic Hospital, London, W. 1, England)

The term Freiberg's "infraction" connotes an element of trauma in the causation of this particular deformity of the head of the second, third, or fourth metatarsal. Debate continues, however, as to the role of injury in this disease.

Fresh necropsy specimens of the articulated second metatarsal and proximal phalanx were subjected to varying amounts of weight—from 1 to 4 pounds—dropped from heights of 3 to 21 inches onto a plunger in a cylinder containing the bones. Force was thus applied to the longitudinal axis of the bones and repeated until a fracture occurred. The phalanx fractured first in 8 of 10 specimens. In two instances, bones from eleven- and twelve-year-old girls, the metatarsal epiphysis was fractured. It is of interest that in these two cases the stage of epiphyseal maturation compared closely with that seen in early Freiberg's infraction. In these two cases radiographs showed little change.

Five cases of Freiberg's disease are discussed with reference to the radiologic findings. Fracture of the metatarsal epiphysis has not been demonstrated. Increased density of the epiphysis has been found, and it is postulated that this represents evidence of callus production. Thickening of the shaft of the affected metatarsal, which occurs later, is felt to be due to stress secondary to loss of dorsiflexion at the metatarsophalangeal joint. The altered shape of the metatarsal head in late, healed cases represents residuals of avascular necrosis secondary to the epiphyseal fracture.

Seven roentgenograms; 4 photographs; 1 diagram; 1 table.

JOHN F. RIESSE, M.D.  
Springfield, Ohio

## GYNECOLOGY AND OBSTETRICS

**The Method of Transfer of Labour Contractions to the Contents of the Uterus.** G. Narik. *J. Obst. & Gynaec. Brit. Emp.* 66: 58-61, February 1959. (I. Universitaets-Frauenklinik, Vienna, Austria)

How the forces produced by the contracting uterine wall are transferred to the uterine contents is one of the main problems of the mechanism of labor. The supposition that the expulsion of the fetus is mainly brought about by hydraulic force is challenged by the author, and an alternative explanation is offered, based upon radiological examinations carried out during delivery on 60 primiparae. To limit exposure to irradiation, no more than four or five roentgenograms were taken of any one patient—frontal (anteroposterior) and lateral views in the first stage (cervix two-fingers dilated) and again early in the second stage when the presenting part had reached the pelvic floor. By additional use of a soft-tissue technic and of intra-uterine instillations of a radiopaque contrast fluid, it was possible to visualize certain soft-tissue structures of the parturient uterus.

X-ray studies showed (1) maintenance of the fundus at about the same level during descent of the presenting

part to the pelvic floor, (2) downward displacement of the margins of the external os during dilatation, (3) gradual and progressive straightening of the fetal spine and apposition of the extremities to the body during each contraction, (4) characteristic change in shape of the uterus during the course of labor from a relatively spherical to a more cylindrical outline, (5) shifting of the amniotic fluid from the upper to the lower segment of the uterus.

The author believes that conditions within the uterus should be compared not to those within a rigid hydraulic system but to those in an elastic system. Shift of amniotic fluid from the upper to the lower uterine segment brings about a direct apposition between the upper segment of the uterine wall and the fetus. Resultant straightening of the fetal spine plays an important role in the mechanism of parturition. It is only when the forewaters rupture that a full application of a hydraulic expulsive force is possible.

Eleven roentgenograms.

**The Mid-Pelvis in Pelvimetry.** J. R. Gerace. *Canad. M. A. J.* 80: 166-168, Feb. 1, 1959. (304 Medical Arts Bldg., Windsor, Ont., Canada)

In reviewing the mechanisms of labor and re-evaluating x-ray films of the pelvis, the author has been impressed by the association of aberrations in delivery with a short posterior sagittal diameter of the midpelvis. This diameter is the distance from the ischial spine to the sacrum as measured along Hodge's third parallel. A reconsideration of Hodge's parallels, the author believes, will lead to a better orientation as to the state of progress in labor. The first of these parallels is in the inlet. The second is from the arch of the pubis to the lower part of the second sacral segment. The third parallel cuts the ischial spines, and the fourth goes through the tip of the coccyx and represents the pelvic floor.

In the normal gynecoid pelvis, the head descends posteriorly, and flexion and rotation are accomplished by the concave wall of the sacrum and the pelvic diaphragm. When the transverse diameter of the mid-plane of the pelvis (the interspinous distance) is narrowed, the bulk of the fetal head must pass either anteriorly or posteriorly to the spines. Only rarely is the forepelvis large enough to permit descent and rotation anterior to the spines, so that in the vast majority of patients the posterior sagittal diameters are the critical measurements. If the posterior sagittal of the midpelvis is not sufficiently large, then labor will be arrested at this site.

In reviewing the literature, the author concludes that the midpelvis is the level of prime obstetric importance. Although he states that the posterior sagittal at the midpelvis is the "one diameter of importance in the whole pelvis," he emphasizes that all the diameters and the general pelvic contour must be taken into consideration in evaluating the adequacy of the pelvis for normal delivery.

Four diagrams. RICHARD H. GREENSPAN, M.D. University of Minnesota Hospitals

**Danger of Embolism with Oily Contrast Media. A Study of the Problem of Media in Hysterosalpingography.** R. Frischkorn. *Schweiz. med. Wochenschr.* 88: 1267-1269, Dec. 13, 1958. (Universitätsfrauenklinik, Göttingen, Germany)

A discussion of the general hazards of hysterosalpingo-

graphy and a description of the author's technic comprise the first part of this report. Forty per cent Iodipin is used unless such inflammatory changes as genital tuberculosis are suspected. In these instances a water-soluble contrast medium is employed.

The second part of the paper consists of a report of a case in which intrauterine injection of 8 c.c. of 40 per cent Iodipin was followed by massive invasion of the contrast oil into the venous plexus. From the uterine venous plexus, the medium progressed into the ovarian and uterine veins. The author is certain that an oil embolism occurred, although there were no objective or subjective signs of this. During this event, the 32-year-old white patient, who had entered the hospital in good condition, felt perfectly well. There were no cerebral symptoms, either on the day of the examination or subsequently.

The author is of the opinion that the danger of oil embolism in hysterosalpingography should not be regarded as a contraindication to the use of oily contrast media.

Three roentgenograms.

HERBERT POLLACK, M.D.  
Chicago, Ill.

## THE GENITOURINARY SYSTEM

**Screening Urethrocystography of Adult Bantu Males Under Manometric Control. Normal and Pathological Findings.** T. Fichardt. *Brit. J. Radiol.* 32: 120-131, February 1959. (Pretoria General Hospital and University, Pretoria, Union of South Africa)

One hundred adult Bantu males (1 cadaver; 22 normal subjects; 77 with disease of the urinary bladder and urethra) were investigated by screening urethrocystography under manometric control. The procedure is begun either (1) by allowing Micropaque to flow under pressure into the urethra and urinary bladder or (2) by injecting Pyelosil 70 per cent under pressure into the urethra and bladder. The anterior and posterior portions of the urethra are then observed fluoroscopically and radiographed in various positions, after which the bladder is allowed to fill with Micropaque or with sterile saline if Pyelosil 70 per cent is being used. Fluoroscopic observations are made and films of the bladder are obtained prior to and during the act of micturition.

A cadaver, adult Bantu male aged twenty-eight years, was used for study of the radiological anatomy of the urethra and bladder. Two main divisions of the urethra are recognized: (a) the anterior urethra, consisting of the pendulous penile, fixed perineal, and bulbous portions, and (b) the posterior urethra, consisting of the external urethral sphincter, prostatic urethra, and internal vesical sphincter. There was no evidence of a *musculus compressor nudae* between the two divisions in the specimen. Furthermore, the indentation in the anterior urethra attributed to this muscle (Morales and Romanus: *Acta radiol.* 39: 453, 1953. Abst. in *Radiology* 62: 627, 1954) was not observed in any of the 100 Bantu studied. Either the muscle is absent in the Bantu or the lack of constant pressure during injection produced the indentation seen by Morales and Romanus.

In the normal group of 22 men, ages twenty to thirty-five years, there were several interesting findings: (1) The external sphincter is recognized by the pencil-point

appearance of the anterior urethra as the lumen narrows when it reaches the closed sphincter. A constant critical pressure is required to open the sphincter in any individual. The pressure range is from 40 to 60 mm. Hg. (2) The posterior urethra acts as a single unit both during retrograde filling and micturition. (3) The muscular wall of the bladder is in a state of tonic contraction as filling begins; with the desire to micturate, the bladder becomes elongated vertically. During micturition it empties "like a pricked balloon," without contraction waves.

The findings in benign prostatic hypertrophy were elongation and angulation of the prostatic urethra, hypertonicity of the sphincters, umbrella depression of the neck of the bladder, and hypertrophy of the bladder wall. The damaged post-prostatectomy internal sphincter is recognized by a patulous vesical neck, a ragged dumbbell deformity at the site of the internal vesical sphincter, a normal external urethral sphincter, and normal act of micturition. The external urethral sphincter controls the bladder outlet and provides normal micturition. In the neurogenic bladder, the neck of the bladder is patulous, and a smooth, funnel-shaped deformity occurs at the internal vesical sphincter site. The external sphincter again is normal and controls micturition. The efficiency of the cord bladder is judged by noting the force of contraction of the bladder, force of the urinary stream, emptying time of the bladder, presence of calculi in the urinary tract, and folds of mucous membrane blocking the vesical opening. In two cases studied following operative damage of the external sphincter, the internal sphincter controlled micturition without aid of the external sphincter.

Sixty-two roentgenograms; 1 photograph; 1 diagram.  
S. B. HAVESON, M.D.  
Los Angeles, Calif.

**Should Intravenous Pyelography Be a Routine Procedure for Children with Cryptorchism or Hypospadias?**  
Lester M. Felton. *J. Urol.* 81: 335-338, February 1959. (New York Hospital, New York, N. Y.)

"Is the incidence of urinary anomalies in patients with cryptorchism or hypospadias high enough to warrant routine intravenous pyelography?"

Campbell (Am. J. Surg. 82: 8, 1951) in a series of 292 cases of cryptorchism coming to autopsy found additional urogenital anomalies in 33 per cent. The present author reviewed the records of 289 patients with cryptorchism seen over a ten-year period and found that of 61 of this number in whom intravenous urography was done without other indication, 13.5 per cent had major anomalies of the upper urinary tract. In the same ten-year period, 142 patients with hypospadias (penile and penoscrotal) were seen, and in 53 of these intravenous urography was performed as a routine procedure. Eight of the group were also cryptorchid, and in 2 of these, as well as in 4 others, upper urinary anomalies were revealed.

The incidence of unsuspected urogenital abnormalities in these two groups—13.5 per cent for cryptorchism and 9 per cent for hypospadias—is compared to an incidence of 2 per cent in an autopsy series of 152 boys of two to fourteen years. In view of this it is concluded that, until it is demonstrated that the radiation from one diagnostic pyelogram is a serious hazard to the individual patient, intravenous pyelography is a worthwhile part of the evaluation of children with either crypt-

orchism or hypospadias. Some suggestions for reducing radiation exposure are offered.

Eight tables.

M. M. MISHKIN, M.D.  
University of Pennsylvania

**The Usefulness of a Contrast Medium Containing an Antibacterial Agent (Retrografin) for Retrograde Pyelography.** Joseph Bloom and J. F. Richardson. *J. Urol.* 81: 332-334, February 1959. (U. S. Naval Hospital, St. Albans, N. Y.)

The risk of introducing or spreading infection in the urinary system remains a hazard in retrograde pyelography. In a series of 100 patients with known urinary tract infection or obstructive uropathy, retrograde pyelography was performed with a new contrast medium, Retrografin, a mixture of sodium and methylglucamine diatrizoate in 30 per cent concentration containing 2.5 per cent neomycin sulfate, a potent antibacterial agent. The addition of neomycin did not impair the quality of the radiographs, and allergic manifestations, such as febrile response, oliguria, or anuria, occasionally encountered with other contrast media, did not appear. Most important to the urologist, as well as the patient, was the lack of evidence, in all 100 cases, of new infection or spread of established infection after the administration of Retrografin.

ROBERT E. CAMPBELL, M.D.  
University of Pennsylvania

## MISCELLANEOUS

**Dermoid and Epidermoid Tumors in the Central Nervous System of Adults.** Collin S. MacCarty, Milam E. Leavens, J. Grafton Love, and James W. Kernoan. *Surg., Gynec. & Obst.* 108: 191-198, February 1959. (Mayo Clinic, Rochester, Minn.)

Seventy-seven cases of epidermoid and dermoid tumors of the central nervous system were seen at the Mayo Clinic before 1955. The present discussion is limited to 63 patients of 15 years or older, of whom there were 44 with epidermoid tumors and 19 with dermoid tumors. The writers deal with all of the clinical aspects of these tumors, but this abstract will be mainly concerned with the radiologic findings.

Epidermoid tumors are of congenital origin, made up of the outer layer of the epidermis, squamous epithelium containing keratohyaline granules, and desquamated epithelium, with occasionally an outer layer of fibrous and connective tissue. Dermoid tumors are teratomas composed primarily of skin and its derivatives; they present calcification more frequently than epidermoids.

Congenital anomalies were associated with 3 of the epidermoids and 50 per cent of the dermoids. These included anomalous fusion of various vertebrae, cyst of the septum pellucidum, dermoid sinuses, harelip, pilonidal sinus, cyst under the occipital portion of the scalp at birth, cervical rib, meningocele, and spina bifida. A surprising number of patients in both groups had mental symptoms.

**Epidermoid Tumors:** Of the 44 epidermoid tumors, 3 were intraorbital, 14 intradiploic, 24 intracranial, and 3 intraspinal. *Intraorbital epidermoid tumors* all caused proptosis in addition to other symptoms; in each of the 3 cases erosion of the orbit was visible roentgenographically.

Roentgenograms of *intradiploic epidermoid tumors*

were usually characteristic, showing involvement of both tables by a smooth, scalloped, sclerotic margin around an area of decreased density. At times both tables appeared expanded or destroyed. In several instances, a curvilinear calcification represented the intracranial wall of the tumor.

Of 24 *intracranial epidermoid tumors*, 8 were in the cerebellopontile angle. Apparently the clinical syndromes are more helpful in diagnosing these tumors than are radiographic methods, although ventriculography was occasionally helpful. Seven patients had intracranial epidermoid tumors in the region of the sella turcica. The skull roentgenograms were normal in 3 cases, but in 4 cases there were various demonstrable changes about the sella or optic canals. In 1 case, not included in this report, calcification was present. In 4 patients with tumors about the temporal lobe, roentgenograms were negative in 1 case, there was secondary clinoid erosion in 1 case, and pineal shifting in 2 cases. Ventriculography was helpful twice, and in 1 case a left carotid angiogram revealed an avascular tumor in the left sylvian region. The remaining miscellaneous tumors did not give specific radiologic findings, although ventriculography was of some assistance.

Erosion of the vertebrae was present in 2 of the 3 cases of *intraspinal epidermoids*. In the remaining 1, roentgenography of the spinal column was normal but myelography revealed the tumor.

**Dermoid Tumors:** The 19 dermoid tumors were located as follows: 9 intracranial, 4 intradiploic, 1 intraorbital, and 5 intraspinal.

Of 9 *intracranial dermoid tumors*, 6 were supratentorial and in all there were abnormal roentgen findings. These included enlargement of the sella, calcification in the suprasellar tumors, erosion of the dorsum and floor of the sella, and destruction of the posterior clinoids. One tumor in the frontal lobe and 3 of the suprasellar tumors showed calcification. There were 3 patients with infratentorial tumors. None had dermal sinuses or skull defects.

The roentgenographic appearance of the *intradiploic dermoid tumors* was similar to that of intradiploic epidermoid tumors.

There was but 1 patient with an *intraorbital dermoid tumor*, showing unilateral proptosis of thirteen years duration. The radiologic findings are not described. Examination revealed a mass behind the globe.

**Intraspinal dermoid tumors** were present in 5 patients. Roentgenograms revealed spina bifida of varying degree in 3 cases and widening of the space between the pedicles in 1 instance. Myelography was used to outline the tumor in 3 cases.

Five roentgenograms; 6 tables.

MORTIMER R. CAMIEL, M.D.  
Brooklyn, N. Y.

**Epidural Tuberculous Abscess Simulating Herniated Lumbar Intervertebral Disk. A Case Report.** Henry G. Decker, Seymour W. Shapiro, and Howard R. Porter. *Ann. Surg.* 149: 294-296, February 1959. (VA Hospital, Des Moines, Iowa)

A case of a tuberculous epidural abscess unassociated with tuberculosis of the spine, meninges, or other organs is reported. The signs and symptoms were those of a herniated lumbar intervertebral disk.

The patient was a 67-year-old male with a three-month history of low back pain and right-sided sciatica, aggravated by coughing, sneezing, or motion of the

spine. A chest film showed two small calcifications in the right paratracheal region. Films of the lumbar spine revealed narrowing of the L5-S1 interspace, osteophyte formation, and sclerotic changes around the sacroiliac joints. A Pantopaque myelogram demonstrated a constant extrinsic pressure defect at the L5-S1 right interspace, with blunting of the nerve root sleeve. An intravenous pyelogram was normal.

A laminectomy was performed and the right L5-S1 nerve root was found to be tense and impinged upon by a mass that exuded purulent material. The dura and surrounding osseous structures were not involved. Histologic examination of the lesion revealed a non-specific granuloma in the epidural adipose and connective tissue. Direct smear and culture demonstrated acid-fast organisms which, on guinea-pig inoculation, proved to be a virulent strain of *Mycobacterium tuberculosis*.

Complete relief of radicular pain was obtained following surgery. An intensive diagnostic work-up postoperatively failed to reveal either active or chronic pulmonary or genitourinary tuberculosis. The authors feel that the epidural abscess resulted from hematogenous dissemination of the infecting organism from a subclinical primary focus, probably in the lung.

One roentgenogram.

CAPT. HOWARD R. GOULD, M.C.  
St. Vincent's Hospital, New York

**Roentgen Aspects of Blastomycosis.** W. L. Bostwell. *Am. J. Roentgenol.* 81: 224-230, February 1959. (1221 S. Broadway, Lexington, Ky.)

The author reports five cases of systemic blastomycosis and describes the roentgen findings, including follow-up examinations.

Pulmonary blastomycosis may manifest itself by different roentgenographic patterns, there being no characteristic appearance. A differential point mentioned in the literature—namely, marked pleural involvement out of proportion to parenchymal disease—was not demonstrated in the author's cases. Inasmuch as the disease is a granuloma, it must be considered with and differentiated from tuberculosis, coccidioidomycosis, moniliasis, histoplasmosis, and torulosis.

Patients with blastomycosis involving bone often present themselves with chronic draining sinuses. Roentgenograms show either bone destruction or periostitis. In any patient with bone involvement, a roentgenogram of the chest should be made because the lung is considered the portal of entry. Blastomycosis should be considered when a destructive bone lesion is found along with pulmonary or pleural involvement.

Eighteen roentgenograms.

RICHARD A. ELMER, M.D.  
Atlanta, Ga.

## TECHNIC

**Transverse Laminography: The Third Dimension in Body Section Roentgenography: Applications in Radiation Therapy.** Bernard Roswit, Sol M. Unger, Joseph Stein, Stanley J. Malsky, and Cyprian B. Reid. *Am. J. Roentgenol.* 81: 130-139, January 1959. (VA Hospital, Bronx 68, N. Y.)

Transverse laminography has received much attention in Europe for over two decades, but until recently little has appeared in the American literature. The authors present their experience with this modality

over the past five years at the Bronx Veterans' Hospital.

The planning of roentgen therapy to deep-seated lesions requires construction of accurate graphic cross sections at the treatment level for localization of the tumor, selection of portals, and orientation of beams. The addition of transverse laminography to the conventional vertical studies greatly enhances the delineation of the volumetric limits of the tumor, as well as providing details of organ displacement by the mass. The principle and technic of the procedure are presented, with accompanying diagrams, photographs, and radiographs. These are of excellent quality and aptly illustrate the value of the third dimension in body-section roentgenography.

It is in the head, neck, and thorax that transverse laminography has been found most helpful as a prelude to treatment planning. Laminograms of radium implants in the tongue and mouth are of particular value in reconstructions and dosage calculations. In check studies following treatment, transverse laminography provides an excellent method of demonstrating tumor regression and in evaluating the final result.

Seventeen roentgenograms; 4 photographs; 6 diagrams.

NORMAN L. ARNETT, M.D.  
Anaheim, Calif.

**Serial Tunnel for Radiography During Operations.**  
Eric Samuel. *Lancet* 1:454, Feb. 28, 1959. (195 Jeppe St., Johannesburg, Union of South Africa)

Radiography during surgical procedures has been hampered by the difficulty of obtaining serial films. The author describes a relatively simple cassette tunnel, which permits up to six serial radiographs to be taken

without disturbing the operative field. The apparatus consists of a tunnel 6 ft. 6 in.  $\times$  2 ft. 3 in., corresponding to the size of a standard operating table. The upper surface of the tunnel is made of lead plywood (1 mm. lead equivalent) except for a 12  $\times$  10-in. or 15  $\times$  12-in. area, made of Perspex, at the junction of the middle and upper thirds. The Perspex window is decentered so that it lies two-thirds to the right of the midline when a 12  $\times$  10-in. area is used. With a 12  $\times$  15-in. area, the widest part of the window lies across the table. A linen runner with six pockets carries 12  $\times$  10-in. or 12  $\times$  15-in. cassettes. The two pockets which lie at the head end of the tunnel contain two dummy cassettes.

The linen runner and the cassettes are loaded into the tunnel preoperatively, and the whole tunnel is placed on the operating table and covered with a radiotransparent foam-nylon mattress. The patient is positioned on the table so that the right hypochondrium lies over the Perspex window and centered before the surgical cleansing. The first of the four cassettes is already in place beneath the window. The films are withdrawn by hand-pulling on the linen runner from the head end of the table. Only the cassette which lies under the Perspex window is exposed, the rest being protected by the lead-ply upper surface.

The apparatus has been found satisfactory for operative cholangiography, splenoportography, and other procedures which do not require rapid cassette changing. The author believes it less cumbersome and less time-consuming than the tunnel described by Rosenburg and Sampson (Am. J. Surg. 93: 878, 1957. Abst. in Radiology 70: 442, 1958).

Two photographs.

## RADIOTHERAPY

**Carcinoma of the Larynx. Results Obtained By Surgery and External Radiation in Ninety-Three Cases.**  
William M. S. Ironside, James W. J. Carpenter, Robert Roedal, and John R. Lindsay. *J. A. M. A.* 169: 783-786, Feb. 21, 1959. (950 E. 59th St., Chicago 37, Ill.)

A series of 93 cases of carcinoma of the larynx treated not less than five years ago is presented. Seventy per cent of the lesions originated in the vocal cords and 29 per cent in the supraglottic area. There was only 1 subglottic case, which was in Stage 2 when laryngectomy was done. The overall five-year survival rate in the supraglottic group was 37 per cent and in the glottic 65 per cent.

The choice of treatment, whether surgery or irradiation, was influenced to some extent by both the location and the stage of the lesion. Surgery as the primary form of treatment gave superior results in Stage 2 and Stage 3 supraglottic tumors. Some patients in these groups who received primary irradiation were subsequently operated upon. In the Stage 1 glottic cases the five-year survival figures are 80 per cent for surgery and 70 per cent for irradiation. In Stage 2 cases, also, surgery appeared to have a slight advantage. One of 2 patients with a Stage 3 glottic lesion lived five years, but none of 5 receiving irradiation survived. One patient with Stage 4 glottic disease lived five years after irradiation followed by operation.

Irradiation factors were 250 kv; h.v.l. 3 mm. copper; treatment distance 50 cm. (thick individuals 80 cm.). Bilateral fields, directly opposed, were used, ranging from 4  $\times$  4 cm. to as large as 6  $\times$  8 cm. The tumor

dose was from 5,000 to 5,500 in thirty-five to forty-two days. Skin reactions were severe, with wet dermatitis.

It is suggested, on the basis of the findings, that patients with supraglottic and subglottic lesions should receive primary surgery, including bilateral neck dissection, except for Stage 1 cases, which should be offered external irradiation as primary treatment. Patients with Stage 1 and rarely Stage 2 glottic lesions should be treated primarily by external irradiation, provided careful follow-up can be assured. Surgery should be used in late Stages 2, 3, and 4, with bilateral neck dissection in Stages 3 and 4 and in cases with subglottic or supraglottic extension.

Four tables.

GORDON L. BARTEK, M.D.  
Grand Rapids, Mich.

**Simple Mastectomy and Postoperative Irradiation for Carcinoma of the Breast. A Report from the Saint John General Hospital.** J. A. Caskey. *Canad. M. A. J.* 80: 251-254, Feb. 15, 1959. (Saint John General Hospital, Saint John, N. B., Canada)

At the beginning of 1952, the staff of the Saint John General Hospital, Saint John, N. B., decided, wherever possible, to apply the McWhirter plan of simple mastectomy and postoperative irradiation to all cases of breast carcinoma referred for treatment.

The 257 cases recorded in this article are all those seen between 1952 and 1956 and include 27 (10 per cent) that were treated radically, 202 (79 per cent) which received the McWhirter treatment, and 28 (11 per cent) given palliative x-irradiation only, hormones,

pparatus  
sponding  
e upper  
(1 mm.  
X 12-in.  
e middle  
centered  
ne when  
in area,  
ble. A  
n. or 12  
e at the  
ettes.  
nto the  
aced on  
sparent  
l on the  
ver the  
cleans-  
n place  
wn by  
end of  
the Per-  
by the  
oper-  
other  
s hang-  
ing.  
s time-  
enburg  
ost. in

or no treatment at all. All deaths were attributed to cancer even though postmortem studies in several cases revealed no evidence of malignancy. The follow-up was 100 per cent, with no untraced cases. The average age of the patients was 55.9 years, the oldest patient being ninety-four and the youngest twenty-four. The survival rates at the time of this report were 52 per cent for 133 Stage I patients, 22 per cent for 57 Stage II cases, 7.5 per cent for 19 Stage III cases, and 18.5 per cent for 48 Stage IV patients.

Radiotherapy was commenced during the second post-operative week and was given in 15 treatments over a three-week period. In the author's 1952-1954 cases treated by simple mastectomy and postoperative irradiation, those which received 3,750 r or more, centrally in the axilla, had a three-year survival rate of 78 per cent as opposed to 46 per cent for those who received less than 3,750 r. For patients under sixty-five these rates were 79.5 and 28.5 per cent respectively. The rate for Stage I was 89 per cent against 75 per cent; for Stages II-IV, 53 per cent against 10 per cent.

These results suggest that the policy of abandoning the radical operation in favor of simple mastectomy and postoperative irradiation was justified. It is pointed out, however, that under present circumstances survival figures for breast cancer from different treatment centers cannot be compared. Infinite variations in the composition of the cases, in clinical and pathological assessment, and in both surgical and radiation treatment methods make such comparisons invalid.

Five tables.

**Primary Fibrosarcoma of the Lung in a Young Child. A Case Treated by Lobectomy and Cobalt Therapy.** F. S. Gerbasi, A. M. Margileth, and R. S. Kibler. *J. Pediat.* 54: 488-495, April 1959. (F. S. G., 2201 E. Jefferson Ave., Detroit 7, Mich.)

Primary fibrosarcoma of the lung, in general, is relatively rare. Its occurrence in a child under three years of age is still more unusual; the authors could find no record of such a case in the literature. Their patient was a boy of two years and nine months. Roentgenograms of the chest were taken because the child seemed to be having some difficulty in breathing. These disclosed a well defined, circular, homogeneous density in the lower half of the right lung field measuring approximately 6 cm. in diameter. The borders were fairly sharply outlined, and the mass was seen in its entirety in the right lower lobe. It was not connected to the diaphragm or to the posterior chest wall. The right minor fissure and the lower portion of the major fissure were also seen as slightly accentuated lines, and there were no signs of atelectasis of the middle lobe. There was no evidence of compression of the surrounding pulmonary tissue nor was there any displacement of the cardiac or mediastinal structures.

The right lower lobe of the lung was excised. The histologic diagnosis was anaplastic fibrosarcoma. For a few months the patient had no complaints. Approximately five months after lobectomy roentgen examination of the skeleton and chest was normal except for a minimal soft-tissue density in the right lower posterior lung field. A right thoracotomy showed the hilus to be infiltrated with tumor tissue, most of which appeared to be encapsulated by a thin, bluish-white membrane. Since nothing could be accomplished surgically in view of the massive involvement of the mediastinum, the child was referred for cobalt-60 therapy. There was a

slight decrease in the size of the metastatic nodules following irradiation, as demonstrated roentgenologically, but this was hardly worth mentioning, and no subjective improvement occurred. The patient died thirteen months after the onset of symptoms.

Three roentgenograms; 2 photomicrographs.

**Advantage of Aimed Pendulum Roentgen Therapy of Esophageal Carcinoma.** Werner Hellriegel. *Strahlentherapie* 108: 43-51, January 1959. (In German) (Universitäts-Röntgeninstitut, Frankfurt a. M., Germany)

Carcinoma of the esophagus is known to be especially radioresistant. Although progress has been made with surgical and radiotherapeutic measures in the last few decades, more effective approaches are still required.

A distinct improvement has recently been achieved with the pendulum type of high-voltage roentgen therapy. The author used this technic in 63 of a series of 145 patients with esophageal cancer seen from 1954 to 1957. All the cases were far advanced. Twenty-five patients had metastatic spread when first seen (to the liver in 10, to the lungs in 1, to the neck and regional nodes in 11, and to the skeletal system in 2). In the remaining case an affected lymph node had invaded the wall of the aorta. Malnutrition, emaciation, dysphagia, and weight loss were of common occurrence. Nausea and vomiting were noted less frequently, and paresis of the recurrent laryngeal nerve was observed in only 4 cases.

The average age of the patients was sixty-five, females being affected somewhat earlier than males. The history dated back four to five months (average). In only 47.6 per cent was treatment started within three months of onset of symptoms. The proximal third of the esophagus was involved in 21 per cent, the midportion in 44 per cent, and the distal third in 35 per cent. In 8 cases with involvement of the distal two-thirds of the esophagus the history dated back twelve months and more, suggesting a rather slow growth. The survival of this group was two to seventeen months. Two of these patients were still alive eighteen months after receiving a tumor dose of 6,000 r with the pendulum technic.

In 41 cases gastrostomy was performed. This procedure proved beneficial not only for by-passing an area of stenosis but also for avoiding trauma to the tumor from ingested food. Of a group of 16 gastrostomy patients, 4 were still alive three years and more following irradiation.

Two types of moving-tube therapy were employed—convergent beam irradiation in 16 patients and the pendulum technic in 47. Other patients were treated with the stationary tube. It was found that pendulum therapy, when properly planned and applied, was far superior to other technics, including contact therapy with radium or radioactive cobalt. The technical factors were 200 to 250 kvp, 2 mm. Cu h.v.l., 50 cm. tube-skin distance, and 4 cm. width of field. The length of the field depended on the extent of the tumor.

Nine patients were too sick for a regular series and therefore received less than 1,000 r. Eighty-four per cent of 76 patients treated with stationary-tube technic died within the first year against 56 per cent of those receiving pendulum therapy. Improvement following the first series of treatments was noted in 55.8 per cent. A total tumor dose of less than 4,000 r had but little effect on the course of the disease, but the survival rate

showed marked improvement with doses of 6,000 r. This latter dose could almost always be accomplished with pendulum therapy but rarely with the stationary-tube technic.

The average survival rate was 6.7 months with stationary-tube therapy against 9.8 months with the moving-tube treatment. Recurrences developed later and less frequently following a proper course of pendulum treatments.

ERNEST KRAFT, M.D.  
Northport, N. Y.

**Sieve (Grid) Radiotherapy of Subcutaneous Lymphoma.** E. Krokowski. *Fortschr. a. d. Geb. d. Röntgenstrahlen* 89: 591-596, November 1958. (In German) (Strahleninstitut der Freien Universität, Berlin-Charlottenburg 9, Germany)

Subcutaneous and superficially located lymphoma is best treated with intermediate roentgen therapy such as will deliver a 50 per cent depth dose in 3 to 5 cm. of tissue. The present investigation is concerned with the determination of any advantage in using the sieve or grid technic with this quality of radiation. The author did fairly extensive depth dose determinations, using four different grids, each 6 × 8 cm. Three of the grids had holes of 5.5 cm. diameter and the fourth had holes of 1.1 cm. diameter. The grid percentages were 28.6, 39.2, 40.5, and 47.5. Despite the limited nature of the investigation, some probably valid conclusions are reached, based on studies on cadavers, phantoms, and patients.

The first conclusion is that, if the lymph node can be easily delineated clinically, if there is no bone or cartilage in the field to be irradiated, and if the node is subcutaneous, intermediate therapy should be used; that is, radiation generated at 110 kvp, with a small open field. Under these circumstances the use of a grid was not found to be of any advantage. The second conclusion is that, if the same conditions prevail but the field includes bone or cartilage, one should treat with a similar tumor dose but use 200-kvp radiation, a small open field, and again no grid. Finally, for extensive neoplasms in the cervical or axillary region, grid therapy at 200 kvp is preferred; the grid should permit a 40.5 or 47.6 per cent transmission of radiation, and the openings should be 1.1 cm. in diameter. For extensive inguinal involvement, similar treatment is used, again with a grid, but sometimes with less penetrating radiation.

Seven figures; 3 tables.

WILLIAM F. WANGNER, M.D.  
Royal Oak, Mich.

**Malignant Lymphomas of the Gastrointestinal Tract.** Joe W. Frazer, Jr. *Surg., Gynec. & Obst.* 108: 182-190, February 1959. (Duke University School of Medicine, Durham, N. C.)

Thirty-one cases of malignant lymphoma of the gastrointestinal tract were seen at the Duke University Hospital (Durham, N. C.), between 1930 and 1952. These included 8 reticulum-cell sarcomas, 9 lymphoblastic lymphosarcomas, 12 lymphocytic lymphosarcomas, and 2 mixed types. There were no cases of Hodgkin's disease or giant follicular lymphoma. Eighteen of the tumors were of gastric origin, 11 were in the small bowel, and 2 were in the colon.

**Gastric Lymphomas:** The average age of the patients with gastric lymphoma was fifty-two years. Symptoms were not characteristic, but an ulcer-like syndrome was

frequent. Radiologic evaluation was the most important diagnostic procedure. Seventeen of the 18 patients showed an abnormality, but the diagnosis was specifically suggested only once. On 12 occasions a filling defect was noted; 3 cases showed hypertrophied rugal folds, and 2 resembled gastric ulcer. The site within the stomach did not help in differentiation from other lesions.

Radiation therapy was given to 6 of the 7 patients whose disease was beyond the scope of surgery. Four received some palliation with reduction in mass size and improvement in well-being. All 6 died within six months. Radiation was also used in 5 of the 9 cases in which resection for cure was attempted. Of the 9 patients, 7 lived longer than five years. One of this group who died of recurrence had not been irradiated. Of the remaining 6 long-term survivors, 4 received postoperative irradiation.

**Lymphomas of the Small Bowel:** The average age in this group was thirty-five years. The presenting clinical picture was that of intestinal obstruction, and obstruction was demonstrated by roentgen examination in 7 cases. In 1 patient a barium enema study disclosed an ileocecal defect and the possibility of a lymphoma was suggested. Five patients received radiation after surgery, but palliation was obtained in only 2. Of three long-term survivors, none received post-operative radiation therapy.

**Lymphomas of the Colon:** Two cases of lymphoma of the colon were seen, one in a six-year-old boy who died two months after surgery in spite of radiation therapy; the other in a fifty-one-year-old male who died post-operatively.

The author emphasizes the tendency of these gastrointestinal neoplasms to remain localized for long periods. The five-year cure rate is high. Seven of 18 patients with gastric lymphoma are living or lived longer than five years, while 3 of 11 with lesions of the small bowel survived more than five years. Wide surgical excision with postoperative radiation therapy is recommended as the best form of therapy.

One photomicrograph; 4 photographs; 4 tables.  
MORTIMER R. CAMIEL, M.D.  
Brooklyn, N. Y.

**Hemangioma with Thrombocytopenia.** Harold W. Dargeon, Amparo C. Adiao, and George T. Pack. *J. Pediat.* 54: 285-295, March 1959. (Memorial Center for Cancer and Allied Diseases, New York, N. Y.)

Hemangioma with associated thrombocytopenia is relatively rare. The authors review 14 cases in which these two entities were observed: 9 from the literature and 5 (2 of which were previously recorded) from the Pediatric and Mixed Tumor Service of the Memorial Center (New York). All but 1 of the tumors were observed at birth or early infancy. In the exceptional case the hemangioma was noted at the age of eighteen months. Thirteen patients showed cutaneous evidence of hemangioma; 1 child never exhibited any cutaneous component of the tumor, and its identity was not established until biopsy was performed nine months after the onset of the illness.

Splenectomy was carried out in 6 of the 13 treated cases. In 1, a satisfactory effect on the thrombocytopenia and tumor was observed within one week after the operation. In the other 5 cases the thrombocytopenia persisted from three to five months. The serious operative and postoperative problems which are sometimes en-

countered are dramatically illustrated by the hemiplegia which occurred in 1 of the cases reported here.

Steroids were used in 4 cases. There was cessation of purpura in 1 patient, in spite of persistence of the thrombopenia. There was slight improvement of the thrombopenia in another. The first patient was on an elimination diet also.

X-ray or radium therapy was administered in 10 cases, and proved to be of value in 7 (including 1 case reported by the authors). In 1, there was only temporary regression of the tumor. In the authors' case the tumor continued to increase in size until three months after the insertion of radon gold seeds, when it was first noticed to be smaller. At the same time, there was significant increase in the platelet count from 20,000 to 134,000 per cubic millimeter. From then on, the tumor progressively decreased in size, and the platelet count rose to a normal level.

Subsidence of the thrombocytopenia always coincided with, or followed, regression of the tumor. The various attempts to explain this relationship are discussed. Utilization and destruction of platelets in the angiomatic mass are considered the most likely explanation.

Nine photographs; 2 tables.

**Treatment of Pterygium by Surgery Followed by Beta Radiation. An Analysis of 256 Cases.** Walter Lentino, Milton M. Zaret, Bertrand Rossignol, and Sidney Rubenfeld. *Am. J. Roentgenol.* **81:** 93-98, January 1959. (Bellevue Hospital, New York, N. Y.)

The authors report a series of 256 patients treated at Bellevue Hospital (New York) with beta-rays following surgical excision. Initially, the beta-ray therapy was given with a radon applicator but later a strontium-90 applicator was used.

Operation was followed within one week by a beta-ray surface dose of about 2,500 rep to the limbus. This was repeated in two weeks. One hundred and sixty-six cases with an observation period of at least six months are analyzed. Among these there were 6 failures, with subsequent recurrence. Three of the failures were unexplained; 3 were due to inadequate surgery, inadequate irradiation, or delay between surgery and irradiation. The study thus indicates that no amount of irradiation is a satisfactory substitute for inadequate surgery, and that insufficient irradiation or too long a delay following surgery increases the chances of recurrence.

The immediate irradiation reactions in this series were self-limited and usually of brief duration. Delayed reactions included (1) telangiectasia of the conjunctiva, in approximately 50 per cent of the patients; (2) keratinization of the conjunctival epithelium, in 1 patient after four years; (3) corneal vascularization and scarring; (4) superficial punctate keratitis. No case of cataract developed, though this cannot be disregarded

as a future possibility. At present, a dosage schedule of 1,000 rep at weekly intervals for three weeks is being used to establish whether it is possible to obtain satisfactory results and still minimize the risk of immediate and late sequelae.

The authors recommend that re-operation followed by beta radiation be used routinely in the treatment of recurrent pterygia.

Four figures; 4 tables.

NORMAN L. ARNETT, M.D.  
Anaheim, Calif.

**Subacute Thyroiditis.** H. Clarkson Meredith, Jr. Virginia M. Month. **86:** 80-82, February 1959. (746 Graydon Ave., Norfolk, Va.)

A case of subacute thyroiditis with hyperthyroidism in a 34-year-old white female is reported. Complete recovery followed a regimen of Meticorten plus 150 r of irradiation in divided doses. It is felt that the x-ray therapy probably shortened the course of the disease.

**Integral Doses at 200 kV and 8 MeV.** D. K. Bewley, A. L. Batchelor, J. Lowe, E. Nataadidjaja, G. R. Newbery, and R. Opie. *Brit. J. Radiol.* **32:** 36-46, January 1959. (Hammersmith Hospital, London, W. 12, England)

The lack of success in correlating clinical reactions with integral dose may be due to the difficulty of obtaining a reliable estimate of integral dose or it may be that integral dose is not the best available statistic, owing to variation in the size of individual patients. Perhaps average dose (integral dose divided by mass) might be more significant.

Calculations of integral dose for 8 Mev were made, from isodose charts based on measurements in water along the axis and diagonals of the fields. At 200 kv it is not possible to use isodose charts for accurate calculations because of the large contribution from volumes where the percentage depth dose is so small that it is not recorded on such charts. Therefore, the method of Meredith and Neary was used here. Calculated values were checked by measurement on the "Celluloid Man," of which a description is given. Agreement was good.

Integral doses based on the same dose to the center of the tumor are compared for the two qualities of radiation. There is not much difference when typical treatment plans are compared (1) because compression is possible with 200 kv, (2) because isodose lines at 200 kv are curved, giving a relatively large dose to the center of the tumor, and (3) because 8 Mev permits the use of fields in which the beam traverses greater thicknesses of tissue. On the other hand, if the same field arrangement is compared for the two energies, the integral dose is greater with 200 kv.

Fourteen figures; 6 tables. LUCILLE DU SAULT  
The Henry Ford Hospital

## RADIOISOTOPES

**Treatment of Thyrotoxicosis with  $I^{131}$ . A Review of 500 Cases.** G. W. Blomfield, H. Eckert, Monica Fisher, H. Miller, D. S. Munro, and G. M. Wilson. *Brit. M. J. 1:* 63-74, Jan. 10, 1959. (University of Sheffield, Sheffield, England)

This article represents a considerable experience, being based on 500 carefully observed cases of thyrotoxicosis

treated with  $I^{131}$ . The following groups were included: (1) patients over forty-five years of age; (2) younger patients with associated diseases with a shortened life expectancy (to less than twenty years); (3) patients with relapses following thyroidectomy or (4) medical (antithyroid) therapy. Pregnancy is a complete contraindication.

The intended dose to the thyroid was 7,000 rads in the average uncomplicated case of thyrotoxicosis with higher or lower doses according to individual indications. Accurate prediction of the dose is difficult and great accuracy cannot be achieved. A method of calculation used by the authors is:

$$\text{Expected rads/mc.} = \frac{820 \times 48\text{-hour}/\% \text{ uptake in preliminary tracer study}}{\text{Estimated gland weight in gm.}}$$

The actual irradiation dose estimated retrospectively is measured by the following formula:

$$\text{Dose in rads} = \frac{164 \times T \times U \times M}{W}$$

where  $T$  is the effective half-life of the isotope in the thyroid,  $U$  is the estimated peak percentage uptake of the therapeutic dose,  $M$  is the dose in millicuries, and  $W$  is the estimated thyroid mass in grams.

After the first treatment, 59 per cent of the authors' series became euthyroid and 10 per cent hypothyroid. A further 21 per cent became euthyroid after two or more treatments. The overall incidence of hypothyroidism was 12 per cent.

Of factors influencing the response to treatment gland size was the most important, but this was difficult to determine accurately. The highest incidence of hypothyroidism occurred in the patients with small glands, the size of which was probably overestimated. The age of the patient and wide variations in uptake and half-life of  $I^{131}$  in the thyroid did not have any consistent effect on the clinical result.

Tracheal compression or deviation by an enlarged thyroid was evident radiologically in 78 patients but was not a contraindication to the use of  $I^{131}$ .

In 160 out of the 500 patients the thyrotoxicosis was associated with cardiac complications. Congestive cardiac failure was present in 60 patients, and two-thirds of these, followed for periods of one to seven years after successful treatment of the thyrotoxicosis with  $I^{131}$ , remained free from further attacks of failure. Auricular fibrillation was observed in 90 patients before treatment and normal sinus rhythm was subsequently restored in 33.

Thirty of the authors' 500 patients had died at the time of this report. There was no evidence that any of the deaths were attributable to  $I^{131}$  therapy. One patient treated after the collection of the original series died of acute leukemia about fifteen months after receiving 4.9 mc of the isotope.

In conclusion, the authors state that, though  $I^{131}$  is effective and safe in the present state of knowledge, it should be given to patients under forty years of age only when other methods of treatment have failed or cannot be used. In older patients it is the method of choice.

Four roentgenograms; 2 photographs; 7 graphs; 9 tables.

SYDNEY F. THOMAS, M.D.  
Palo Alto, Calif.

**The Treatment of Disease of the Thyroid by Irradiation.** W. P. Holman. M. J. Australia 2: 825-827, Dec. 20, 1958. (Cancer Institute Board, Melbourne, Victoria, Australia)

In contrast to the earlier rigid selection of patients for radioiodine therapy, it is now widely held that this is the treatment of choice for smooth toxic goiters, being contraindicated only during pregnancy (after the twelfth

week) and lactation. A single dose of 7 millicuries is used for the average patient, with 8 millicuries for "large" glands, 9 for "very large" glands, and 6 for small or postoperative glands. Antithyroid medication should be discontinued two days prior to the administration of  $I^{131}$  and may be resumed two days after treatment and continued for a maximum of six weeks.

The author discusses the possible radiation hazards. He has heard of no instance of carcinoma developing following treatment. Two reported cases of leukemia he attributes to coincidence. Genetic hazards are dismissed on the grounds of the low dosage. With a therapeutic dose of 7 millicuries, the tissues receive, on an average, 4 rads, which can be taken as the whole-body irradiation. The reproductive organs receive 10 rads, which is of the same order as from some diagnostic procedures.

Two cases of metastasizing cancer of the thyroid were treated. In one of these a satisfactory result was achieved. The second patient obtained some relief but in this instance isotope therapy was supplemented by 3,000 r of x-irradiation. The author does not advocate radioiodine treatment of toxic nodular goiters.

Six tables.

PAUL MASSIK, M.D.  
Quincy, Mass.

**Effect of Oral Lipiodol on Thyroidal  $I^{131}$  Uptake and Serum Protein-Bound Iodine Concentration.** Anne C. Carter, Shirley Weisenfeld, and Eleanor Z. Wallace, with the technical assistance of Harold Schwartz and Marguerita Pasculo. J. Clin. Endocrinol. 19: 234-238, February 1959. (State University of New York College of Medicine at New York City, N. Y.)

Organic iodine compounds used in roentgenologic diagnosis have been shown to elevate the level of protein-bound iodine (PBI) and/or lower the uptake of  $I^{131}$  by the thyroid gland for prolonged periods of time. Lipiodol, when used for bronchography or myelography, is one such agent, presumably because it is so slowly absorbed from the lungs and spinal canal.

A study to determine the effect of orally administered Lipiodol on serum PBI and  $I^{131}$  uptake was undertaken in 4 euthyroid male patients (ages twelve to fifteen years; 2 with spina bifida and 2 with muscular dystrophy). Each patient received 20 ml. of Lipiodol (containing 540 mg. of iodine per ml.) orally.

Thyroidal twenty-four hour  $I^{131}$  uptakes (normal range 15-50 per cent) after an oral dose of 10 microcuries of  $I^{131}$  and serum protein-bound iodine (normal range 4.0-8.7 micrograms per 100 ml.) were determined before oral administration of Lipiodol and at intervals thereafter for the duration of the study (445 days). Free iodine (FI) was taken as the difference between the total iodine and PBI. FI, according to Astwood, does not normally exceed 2 micrograms per hundred milliliters.

In all 4 subjects the thyroidal  $I^{131}$  uptake was suppressed immediately after the administration of Lipiodol and remained low (usually below 15 per cent uptake per twenty-four hours) throughout the duration of the study. The PBI concentration showed a very great initial rise, dropping somewhat rapidly over the next three or four months. Thereafter, the PBI level dropped very slowly, if at all, and remained above normal for the duration of the study.

The level of FI was determined late in the study and found to be elevated in all 4 patients. At the end of the study (445 days) it was still high in the 2 patients with muscular dystrophy, but normal in the others.

It is concluded by the authors that Lipiodol, when taken orally, may affect certain thyroid function studies ( $I^{131}$  uptake and PBI) for a prolonged period, just as it can when used in myelography or bronchography. The study seems to indicate that the medium is absorbed and stored in an unknown site and that iodine is presumably released continually in quantities that are sufficient to lower the  $I^{131}$  uptake and elevate the levels of PBI.

One graph; 1 table. JOSEPH M. BEHUN, M.D.  
Mercy Hospital, Pittsburgh

**Isotope Circulation Studies in Congenital Heart Disease.** Richard H. Greenspan, Richard G. Lester, James F. Marvin, and Kurt Amplatz. *J.A.M.A.* 169: 667-672, Feb. 14, 1959. (University of Minnesota, Minneapolis, Minn.)

Some of the advantages and limitations of angiography, cardiac catheterization, and conventional radiographic techniques in the definitive diagnosis of congenital heart disease are reviewed. Right-to-left shunts in particular may be difficult to detect and localize accurately. A new procedure is described for demonstration of such a shunt.  $I^{131}$ -labeled sodium and methylglucamine diatrizoate (Renografin) serves as a rapidly excreted radioactive tracer. Three carefully placed collimated scintillation counters are utilized: one over the precordium, one over a peripheral lung field, and one over a femoral artery. Injection of the radioactive material is made into the various chambers of the heart by way of a catheter inserted through a vein, or occasionally by direct venipuncture. Doses of radioactive material average about 1 microcurie per kilogram of body weight for the initial studies. Larger doses must be used for multiple injections in order to detect accurately changes over background body activity. The time of appearance of increased radioactivity and the relative degree of activity at the three measurement sites have been found to give valuable information that cannot be obtained from electrocardiograms, pressure recordings, and angiograms alone. Specialized, transistorized, compact and portable electronic recording devices were developed by these workers for their study.

In 42 patients suspected of having right-to-left shunts the procedure described has given reliable and helpful information. Characteristic findings include a shortened heart-to-femoral artery circulation time in right-to-left shunts (about two seconds as compared to the normal five to twelve seconds). In left-to-right shunts, the appearance time of radioactivity in the femoral artery is normal but the degree of activity shows a slow rise rather than the usual rapid elevation seen in normal individuals. Seventeen studies in patients with mitral stenosis indicated delayed appearance of radioactivity in the femoral artery up to about twenty seconds after its appearance in the heart. Characteristic graphs are presented for the entities under study.

This method is easily performed and obviates the need for puncturing the femoral artery, which is particularly likely to be difficult in infants and young children. The procedure appears to be fairly reliable in demonstration of small shunts of a type which may be missed by the usual angiographic studies because of the passage of insufficient amounts of contrast material through the shunt.

Five figures.

JAMES W. BARBER, M.D.  
Cheyenne, Wyo.

**The Use of Radioactive Isotopes in the Study of Colonic Absorption.** J. K. Isley, A. P. Sanders, K. W. Sharpe, R. J. Reeves, and G. J. Baylin. *Am. J. Roentgenol.* 81: 89-92, January 1959. (Duke University Medical Center, Durham, N. C.)

The preferential absorption of certain materials by the colonic mucosa forms the basis for the present study of its integrity by the use of radioactive labeled material. The investigation consisted of two parts, one pertaining to man and the other to dogs. For both the subjects were divided into four groups, each receiving a different  $I^{131}$ -labeled material: sodium iodide, oleic acid, glycerol trioleate, and human serum albumin. These substances were introduced per rectum along with a barium-enema. After the procedure, the groups were again divided as to normal or abnormal depending upon the barium-enema findings.

In the human group, both normal and abnormal, there was no definite evidence of absorption of the labeled oleic acid, glycerol trioleate, or human serum albumin. There was absorption of the ionic iodine in every case. Some absorption of all of the materials from the dog colon was noted, with the exception of oleic acid.

In those persons shown to be normal by barium enema examination, the average percentage of administered dose in the blood was higher than in those with chronic colon disease. This was specifically true in chronic ulcerative colitis. It seems likely therefore that this procedure, or one similar to it, may prove useful in evaluating the colonic mucosa.

Four tables. NORMAN L. ARNETT, M.D.  
Anaheim, Calif.

**Deposition and Storage of Vitamin B<sub>12</sub> in the Normal and Diseased Liver.** George B. Jerzy Glass. *Gastroenterology* 36: 180-190, February 1959. (New York Medical College, Flower and Fifth Avenue Hospitals, New York, N. Y.)

This paper deals with some of the new data collected by means of isotope techniques on the deposition and storage of  $B_{12}$  in the liver.

Radioactive  $B_{12}$  was obtained by incorporating a short-lived  $Co^{60}$  or  $Co^{68}$ , or a long-lived  $Co^{60}$ , into the  $B_{12}$  molecule. All of these isotopes emit strong gamma radiation which can be quantitated by means of a scintillation counter. Thus, the content of radioactive  $B_{12}$  in a given organ can be determined easily.

In studying the mechanisms governing hepatic deposition, storage, and discharge of Vitamin  $B_{12}$  in health and disease, the author determined and analyzed the surface radioactivity over the liver in 100 normal individuals and in 36 with various hepatic diseases, following the administration of  $Co^{60} B_{12}$ . Studies were also made in 8 patients with pernicious anemia in remission. The radioactivity was also measured in the liver (1) by external recording, (2) in serial surgical liver biopsies, and (3) in the internal organs at autopsy, in 8 dogs, observed for seven to ten months following administration of a single dose of radioactive  $B_{12}$ .

In normal individuals, the administration of radioactive  $B_{12}$  by mouth results in an accumulation of radioactivity over the liver. In pernicious anemia or after total gastrectomy, the hepatic uptake is nil or present only in traces; when intrinsic factor is added, the uptake becomes normal. In sprue,  $B_{12}$  is again not absorbed in the intestine and the hepatic uptake is nil or present only in traces. The addition of intrinsic factors is without influence in these cases.

In liver disease, the hepatic uptake is decreased and, as expected, is not elevated by the addition of intrinsic factor. A diseased liver is unable to deposit and store  $B_{12}$  and a high  $B_{12}$  blood level is observed, due in part at least, to the inability of the damaged liver cells to remove  $B_{12}$  from the circulation.

The liver is the main storage organ for vitamin  $B_{12}$  in man and the dog. In man the discharge of the vitamin from the liver is very slow—much slower than in dogs—the biologic half-life averaging ten months, with individual variations ranging from five to thirty months. This explains the long remissions in pernicious anemia, after adequate treatment, and the long latent periods preceding the development of  $B_{12}$  deficiency and macrocytic anemia in dietary  $B_{12}$  deprivation and following total gastrectomy.

Ten figures; 1 table. SHAWKI ASMAR, M.D.  
Cleveland Metropolitan General Hospital

**Rate of Production of  $P^{32}$ -Labeled Lymphocytes.**  
Seymour Perry, Charles G. Craddock, Jr., Lutz Venzke, Gaetano Crepaldi, and John S. Lawrence. *Blood* 14: 50-59, January 1959. (University of California Medical Center, Los Angeles, Calif.)

Experiments are reported which confirm previous studies showing that enough lymphocytes enter the blood stream through the thoracic duct to replace those circulating in the peripheral blood several times daily. The thoracic ducts of mongrel dogs were cannulated and lymph was collected at various periods following the administration of  $P^{32}$ , up to one hundred and forty-four hours. A DNA extraction technic was employed.

That the maturation time for lymphocytes is extremely short appears to be established by the fact that the curve of the thoracic duct lymphocyte DNA- $P^{32}$  activity shows an early peak. After this peak has been reached, interpretation of the curve becomes more difficult. The authors point out that this may reflect (1) cells labeled continuously to an extent proportional to the plasma  $P^{32}$  and released immediately upon maturation, or (2) cells labeled only at the initially high plasma  $P^{32}$  level and gradually released, or (3) both. It is also pointed out that the cells probably leave the blood very rapidly after entry from the lymphatics because there is no sharp rise to the curve of the labeled (or newly formed) lymphocytes in the peripheral blood. [The experiment described is a meticulous one but will work out with a good technic, which will probably be improved upon when other more specific isotopic labeling techniques are developed.—S.F.T.]

Nine figures. SYDNEY F. THOMAS, M.D.  
Palo Alto, Calif.

**Effect of Anaemia and Transfusion Polycythaemia on Phosphorus and Iron Uptake in Erythrocyte Precursors in Rat Bone Marrow, Studied by Means of a Triple Tracer Technique with  $^{32}P$ ,  $^{59}Fe$  and  $^{51}Cr$ .**  
Joseph P. Kriss, Edwin O. Field, and John E. Gibbs. *Brit. J. Haemat.* 5: 92-101, January 1959. (E. O. F., Royal Marsden Hospital, London, England)

The authors note that bleeding, acute hemolysis, and hypoxia cause an increased rate of hemopoiesis as judged by reticulocytosis, by an increased  $Fe^{59}$  uptake detectable over the femur, an accelerated rate of appearance of newly formed  $Fe^{59}$ -labeled erythrocytes in the circulation, and by an increased concentration of nucleated erythrocytes in the marrow. The plasma of such anemic or hypoxic animals contains a substance which is capable of stimulating erythrocyte release in normal or hypophysectomized recipients.

Conversely, transfusion is followed by a decreased rate of appearance of newly formed erythrocytes. Repeated blood transfusion causes bone marrow atrophy and fibrosis, reduces the number of circulating reticulocytes, and suppresses the appearance of  $Fe^{59}$  in circulating red cells.

The design of the experiment reported here was to determine whether the  $P^{32}$  uptake of marrow cells of rats could be inhibited by transfusion and increased by bleeding, and to compare the stages at which  $P^{32}$  and  $Fe^{59}$ , respectively, were incorporated into erythrocyte precursors.

Using  $Cr^{51}$  for labeling, the authors made the following observations:

"Two days following a single transfusion of packed red cells the  $^{32}P$  uptake of marrow cells was significantly suppressed, and the rate of appearance of  $^{59}Fe$  in circulating erythrocytes was reduced. The  $^{59}Fe$  content of marrow cells was reduced at four hours but was equal to or greater than that of controls twenty-four hours after administration of the isotope.

"Evidence is presented to support the belief that  $^{32}P$  and  $^{59}Fe$  label different marrow-cell populations, and that inhibitory or stimulating mechanisms may affect different stages in the maturation cycle to different degrees.

"This work is considered to provide the experimental basis for an attempt to inhibit  $^{32}P$  uptake of normal marrow cells of human patients receiving the isotope for therapy of neoplastic disease."

A method is described in the appendix to this paper for measuring the activities of  $Fe^{59}$  and  $Cr^{51}$  in the same sample.

Seven figures, including 2 photographs; 3 tables. SYDNEY F. THOMAS, M.D.  
Palo Alto, Calif.

## RADIATION EFFECTS

**Radiation Nephritis. Report of a Fatal Case.**  
Bernard F. Schreiner and Robert M. Greendyke. *Am. J. Med.* 26: 146-151, January 1959. (Strong Memorial Hospital, Rochester, N. Y.)

A fatal case of radiation nephritis in a 14-year-old boy is reported. The patient was first seen on July 11, 1955, because of painless enlargement of the right testicle noted nine days before. Physical examination was normal except for the testicular mass. A chest roentgenogram and intravenous pyelogram were normal. Radical excision of the right testicle was performed on

July 19, and the tumor proved to be a teratocarcinoma. On July 26 a right, radical, retroperitoneal lymph node dissection was carried out; no evidence of metastatic tumor was found. On August 8 a course of deep x-ray therapy to the abdomen was started. A total tumor dose of between 4,400 r maximum and 4,000 r minimum was administered over a period of twenty-six days through anterior and posterior 10  $\times$  20-cm. ports on either side of the abdomen. Irradiation was well tolerated, although a marked erythema and some desquamation of the skin occurred over the treated sites.

The patient did well until December 1955, when increasing fatigability, exertional dyspnea, palpitations, marked pallor, nausea, vomiting, and tarry stools led to re-admission to the hospital. Blood pressure was 146/65 mm. Hg. Positive findings included small left axillary and supraventricular lymph nodes and a small left retinal hemorrhage. The skin over the anterior and posterior abdomen bilaterally showed moderate x-ray pigmentation and numerous small telangiectases. There was a profound normochromic anemia with a hematocrit of 11.5 per cent, reticulocytosis of 12 per cent, and a white blood cell count of 17,700 per c. mm. Urinalysis revealed 3-plus proteinuria, microscopic hematuria and pyuria, and occasional hyaline and granular casts. Stool specimens were tarry and gave a 4-plus guaiac reaction. The blood urea nitrogen was 54 mg. per 100 ml.

The patient's symptoms abated following multiple transfusions but no source for the gastrointestinal bleeding was found. Intravenous pyelography revealed poor concentrating ability; drainage structures on the right were not visualized. Following discharge from the hospital, uremia and melena persisted, necessitating two further hospitalizations during the next sixty days. Physical findings were unchanged except for the appearance of labile hypertension and more prominent dermal telangiectases. Meticorten was given in an effort to decrease gastrointestinal bleeding, thought to be related to diffuse telangiectasia. Blood urea nitrogen rose to 117 mg. per cent. Two days later progressive improvement occurred associated with sudden return of appetite, considerable diuresis, progressive fall of blood urea nitrogen to 42 mg. per cent and less gastrointestinal blood loss.

During the following month anasarca developed with a fixed hypertension, and the administration of Meticorten was discontinued. Moderate leukopenia and thrombocytopenia were noted for the first time, and there was a question of splenic enlargement. Gastrointestinal bleeding increased, and uremia became more severe. Death occurred on April 4, 1956.

Findings at autopsy duplicated those in previously reported cases of radiation nephritis—thickened renal capsules, degenerative glomerular changes, tubular atrophy and interstitial fibrosis and endarteritis. The right kidney was more markedly affected than the left. It is thought that the more extensive capsular and parenchymal involvement on the right might be related to the extensive surgery and resultant fibrosis.

Other clinical features in this case deserve further comment. The telangiectases over the abdominal wall and back developed quite soon after radiation and were rather extensive. This finding aroused suspicion that gastrointestinal telangiectasis might have been a contributing cause of the protracted melena, and this was later confirmed at autopsy. Whether the protracted blood loss hastened the patient's renal failure or even caused deterioration in what otherwise might have been a relatively stable situation remains problematic. Meticorten was employed in the hope of decreasing the degree of capillary bleeding. Although initially, clinical and hematological improvement coincided with its use, it would be difficult to establish a cause-and-effect relationship. Later in the patient's illness, the steroid seemed to have no appreciable effect, nor did it appear to contribute to the progressive renal insufficiency. The late development of leukopenia and thrombocytopenia remains unexplained.

Nephritis is an unusual complication of radiation therapy. There is some clinical evidence to suggest that renal insufficiency develops only when both renal areas have been irradiated with at least 2,500 r (depth) and when less than one-third of the total renal tissue is outside the critical radiation field (Kunkler *et al.*: *Brit. J. Radiol.* 25: 190, 1952. *Abst. in Radiology* 60: 326, 1953). The present authors believe that the natural history and prognosis of a given neoplasm, and the probable efficacy of radiation therapy, should be weighed against the danger of delivering bilateral renal radiation of potentially lethal degree.

One photograph; 2 photomicrographs; 1 chart.

**Irradiation of the Entire Body and Marrow Transplantation: Some Observations and Comments.** E. Donnall Thomas, Harry L. Lochte, Jr., and Joseph W. Ferrebee. *Blood* 14: 1-23, January 1959. (Mary Imogene Bassett Hospital, Cooperstown, N. Y.)

Much of this article is of primary interest to the hematologist. The radiologist, however, will get a great deal out of the discussion of the physical and biological problems involved in total-body irradiation and marrow replacement. He will also find the technical details of the delivery of uniform irradiation to a large volume most useful. Two opposed cobalt units with a 2-meter distance between each source and the midline of the patient lying in a centrally placed bed will afford a uniformity of effect that begins to approximate conditions known to be successful in mice.

Importance of uniformity of irradiation is stressed. It is pointed out that overtreating some areas and under-treating others is disastrous in a situation complicated by ubiquitous malignant cells. Optimal radiation would appear to be prolonged and of low rate, uniform, and generally calculated to extend over a period and area sufficient to catch each cell at its most radiosensitive and vulnerable time in the mitotic cycle.

After whole-body irradiation in the range of 300 to 700 r, death is primarily due to marrow failure. Experimental studies with marrow transplantation in an effort to repair the radiation damage are reviewed, and the problems involved in such treatment in man are discussed.

The authors point out that marrow function is more easily restored after irradiation than lymphoid function. Considerable evidence indicates that infusions of marrow do not restore satisfactory function in irradiated lymph nodes and spleens. Marrow is erythropoietic and myelopoietic but insufficiently lymphopoietic for these purposes, even when the difficulties of foreign marrow reaction are circumvented by adequate irradiation and the infusion of tolerant material.

The authors report 5 cases of acute leukemia in which treatment was by total-body irradiation followed by intravenous infusion of bone marrow. Of a series of several patients, of which these are a part, only 2 could be said to have received any significant clinical benefit.

Four figures; 1 table. SYDNEY F. THOMAS, M.D.  
Palo Alto, Calif.

**Burn Following Accidental Exposure to High Energy Radiation.** Lester M. Cramer, John H. Waite, John H. Edgcomb, Clinton C. Powell, John H. Tuohy, Eugene J. Van Scott, and Robert R. Smith. *Ann. Surg.* 149: 236-293, February 1959. (National Cancer Institute, Bethesda, Md.)

A unique aspect of this article is the histopathologic

sequence described following an accidental exposure to radiation energy from a Van de Graaff accelerator. Exact exposure dosage is not known but reconstruction of factors places the total electron dose at about 7,200 rep at the point of highest skin exposure. The peak energy of the electron beam was 0.6 Mev. The highest dose of penetrating x-radiation was estimated to be not over 100 r. Exposure time was approximately three seconds.

The case history presented follows the entire clinical course from the initial exposure to the 608th day and includes the pathological reports on excised tissue. No symptoms that could be identified as belonging to the acute radiation syndrome were seen, but none were anticipated, since the type of energy involved was almost wholly absorbed by 3 to 6 mm. of tissue.

The authors compare their staging of cutaneous response against that proposed by Robbins *et al.* (Radiology 46: 1, 1946) and Knowlton *et al.* (J.A.M.A. 141: 239, 1949. Abst. in Radiology 55: 475, 1950).

One color plate; 8 photomicrographs; 1 table.

JOHN C. POWERS, M.D.  
St. Vincent's Hospital, New York

**Reducing Gonad Irradiation in Pediatric Diagnosis.**  
Harry A. Bishop, Milo Webber, and Bernard J. O'Loughlin. California Med. 90: 20-25, January 1959. (University of California School of Medicine, Los Angeles 24, Calif.)

The greatest danger of carcinogenesis and of genetic damage through diagnostic radiological procedures is in children, whose small bodies are more vulnerable and who have a longer life span in which to realize this hazard. For their own determinations of exposure the authors used small sensitive dosimetry films. These were attached to the bodies of all children examined radiographically in a period of seven weeks—one to the skin where it would lie in the central beam, one on or near the scrotum or on the skin of the upper medial anterior thigh. The table shows gonad exposure, as reported in the literature, for various examinations.

Measures for reducing the dose to the skin and gonads are assembled from the literature. These include additional filtration, reduction of cone size, higher tube potentials, lead shielding, and the use of intensifying screens. Aside from technical factors the largest item in the overall reduction of exposure is the avoidance of unnecessary and undiagnostic studies. Fluoroscopy is the most dangerous of procedures and should be avoided when possible. Complete dark-adaptation of the eyes and the use of a small beam with the shortest possible exposure time use will minimize danger from this source.

Two charts; 5 tables. SYDNEY F. THOMAS, M.D.  
Palo Alto, Calif.

**A Primer on Radiation Hazards for Physicians.**  
Richard E. Peterson, Julius G. Baron, Bartis M. Kent, and Titus C. Evans. Arch. Int. Med. 103: 308-328, February 1959. (University Hospitals, Iowa City, Iowa)

The citizen physician should be prepared to help maintain proper perspective in community discussions on radiation hazards. The material contained in the present *Primer on Radiation Hazards for Physicians* appeared as a Scientific Exhibit at the 43rd Annual Meeting of the Radiological Society of North America, Chicago, November 1957. It gives conclusions and opinions drawn from 107 references on the subject.

Four figures; 5 tables.

**Half a Century of Progress in Radiodiagnostic Protection.** J. A. Bloomfield. M. J. Australia 1: 289-292, Feb. 28, 1959.

The author reviews data published by others relative to the hazards and possible delayed untoward effects resulting from medical uses of ionizing radiation. He attempts by means of these data to place a proper perspective on the apparently small risk in contrast to the great medical gains to be realized from judicious use of diagnostic and therapeutic applications of radiation. The communication contains general information helpful

GONAD AREA EXPOSURE DOSES IN DIAGNOSTIC RADIOPHOTOGRAPHY OF CHILDREN (IN MILLIROENTGENS)  
(BISHOP, WEBBER, AND O'LOUGHLIN)

	0-2 Yr.		Age Group		7-11 Yr.	
	Male	Female	Male	Female	Male	Female
Chest, postero-anterior	0	2	0	0	0	0
Chest, postero-anterior	5	...	...	...	...	...
Chest, postero-anterior	...	...	0.2	0.06	3.3	3.3
Chest, lateral	...	...	0.5	6.0	0.15	6.0
Skull, basal	1	1	0	0	0	0
Skull, lateral	...	...	0.01	0.025	0.006	0.02
Skull series	...	...	...	...	0.4	0.25
Abdomen, anteroposterior	150	...	310	130	250	240
Abdomen, anteroposterior	...	...	82	46	240	95
Lumbar spine, lateral	800	300	500	1,200	300	730
Lumbar spine, lateral	...	...	190	110	145	180
Lumbar spine series	...	...	270	160	300	250
Pelvis, anteroposterior	160	90	280	140	700	300
Pelvis, anteroposterior	...	...	90	50	120	50
Hip, anteroposterior and lateral	...	...	180	100	570	200
IVP	500	300	1,008	678	1,520	1,384
IVP	...	...	330	180	1,000	370
IVP	...	...	...	...	654	706
Gastrointestinal series	220	...	496	...	220	...
Gastrointestinal series	...	...	32	96	50	185
Barium enema	450	400	700	455	900	800
Barium enema	...	...	36	96	64	220

to those desiring background information in the field of radiation hazards.

Four tables.

JAMES W. BARBER, M.D.  
Cheyenne, Wyo.

**Acquired Radioresistance. A Review of the Literature and Report of a Confirmatory Experiment.** Michael P. Daquisto. *Radiation Res.* 10: 118-129, February 1959. (Walter Reed Army Institute of Research, Washington, D. C.)

The development of significant radioresistance as a result of exposure to small doses of x-irradiation seems to be well established experimentally. The author describes an attempt to delineate some time and exposure relationships of this acquired radioresistance.

For control adult female white Swiss mice, Walter Reed strain, the LD 50/30 was found to be  $487 \pm 25.7$  r. This increased to  $560 \pm 31.0$  r if the mice were given 50 r whole-body irradiation, ten days earlier, and to  $617 \pm 32.0$  r if the interval was extended to seventeen days. In this experiment radioresistance was manifest at both ten and seventeen days after the small exposure.

Analysis of spleen and thymus weights under the conditions of the present experiments gave no clue to the mechanism of the acquired radioresistance. Alternate hypotheses are discussed, but the phenomenon remains unexplained.

Five graphs; 2 tables.

**Rate of Recovery from Radiation Damage and Its Possible Relationship to Life Shortening in Mice.** John B. Storer. *Radiation Res.* 10: 180-196, February 1959. (Roscoe B. Jackson Memorial Hospital, Bar Harbor, Me.)

Blair (University of Rochester Reports UR-206 and UR-207, 1952), utilizing the concept of a constant repair rate for repairable radiation damage and the premise that a portion of the damage does not repair, has advanced an interesting hypothesis that attempts to relate the acute LD 50 to mean survival time (life shortening) at long intervals after radiation exposures. Since various reports are available on the survival times of mice exposed to a variety of daily doses of radiation, it was considered worthwhile to re-examine these data and to calculate mean recovery rate constants for animals exposed to different numbers of daily doses. If a systematic variation in recovery rate with a number of fractions could be demonstrated, it was then planned to modify certain aspects of Blair's hypothesis accordingly and to apply the modified hypothesis to certain cases of experimentally produced life shortening from radiation. These calculations and modifications of the Blair hypothesis are the subject of the present report.

The author found that the mean rate at which mice recover from the radiation damage contributing to acute death can be related empirically to the number of daily radiation doses delivered. Recovery from neutron-induced damage is slower at all intervals than from that caused by x- or  $\gamma$ -radiation. By using the empirically derived relationships and certain assumptions about the change in LD 50 with age, it was possible to predict the general form of the relation between daily dose and shortening of life span. The application of the equations obtained to the problem of increased sensitivity to further exposure after various regimens of small daily doses is discussed. A hypothesis relating recovery rate to life shortening in general is advanced.

Five graphs; 6 tables.

**Short and Long-Term Observations Concerning the Effect of Homologous and Heterologous Cell-Free Spleen Extracts on Radiation Mortality in Mice and Guinea Pigs.** F. Ellinger. *Atompraxis* 4: 439-444, December 1958. (Naval Medical Research Institute, Bethesda, Md.)

Previous and current investigations indicate that cell-free saline whole extracts from the spleens of mice and guinea-pigs contain a humoral factor which protects the same or a different animal species against irradiation death. The cell-free crude spleen extracts used in these experiments not only protect against the immediate lethal action of ionizing radiation but remain effective for a period of many months. Cell-free organ extracts avoid, therefore, one of the main difficulties encountered in the utilization of organ preparations containing viable cells, namely, the immunobiological rejection reaction against the implant, manifested in weight loss and delayed deaths some months after irradiation when recuperation of the reticuloendothelial system from the impact of irradiation occurs. They offer, furthermore, the additional advantage of easy storage over many months.

The author's preliminary physicochemical studies seem to point to a method of separating the protective factor of spleen extracts from simultaneously present chemical components of inert or even toxic nature. It appears, therefore, that the previously expressed "hope" of obtaining an effective nontoxic, universally applicable countermeasure against radiation-induced mortality, to be employed in the postirradiation period, can now be achieved, but this obviously will not be easy.

Six graphs.

**The Response of Eosinophils to Total-Body X-Radiation of the Monkey.** Earl Eldred. *Blood* 14: 187-193, February 1959. (University of California School of Medicine, Los Angeles 24, Calif.)

The response of eosinophils in the peripheral blood of the *Rhesus* monkey to total body-x-radiation in the median lethal range was studied. Each of a series of 23 presumably normal animals was given a single dose of 550 or 600 r (conventional x-ray qualities). Eosinophil counts were made at frequent intervals with special counting procedures utilizing the phloxine-propylene glycol technic. For each animal a pre-exposure eosinophil base line had been determined.

Typically the eosinophil levels fell to about one-half their pretreatment value during the first three days. By the fourth and fifth days eosinophils were seriously depleted and for many days thereafter were scarce. In those monkeys which survived, a "wave of eosinophilia" appeared between the thirtieth and the fortieth day, at which time counts reached as high as 16,300 cells per cubic mm. (average normal level around 500 per cubic mm.). The eosinophil count tended to remain at high levels over ninety days following exposure. Maximal eosinophilia occurred in the fifth to seventh weeks.

The author presents data published by others showing similar findings for monkeys and for other animals subjected to similar experiments. He also notes that relative eosinophilia following clinical irradiation has been known for some time.

Typical curves showing circulating eosinophil levels are reproduced.

Two graphs.

JAMES W. BARBER, M.D.  
Cheyenne, Wyo.

**The Effect of X-Irradiation on the Antioxidant Activity of Mammalian Tissues.** Albert A. Barber and Karl M. Wilbur. *Radiation Res.* 10: 167-175, February 1959. (A. A. B., Department of Zoology, University of California, Los Angeles 24, Calif.)

Two lines of investigation have indicated that oxidation reactions are of significance during the initial phases of radiation damage. The first concerns radical production in aqueous media exposed to ionizing radiation, and the second chemical protection both *in vitro* and *in vivo*. The studies on chemical protection have indicated that one of the mechanisms might involve the inhibition of the oxidation reactions due to free radical activity, and many of the protective agents such as reducing agents and chelating agents do have antioxidant properties.

The absence of lipid peroxides in normal animal tissue suggests that some antioxidant mechanism prevents their formation; their presence in irradiated tissues has been explained by the destruction of this normal antioxidant activity by radiation. To determine whether this is the case, studies were made of tissues from normal and irradiated animals.

Tissue antioxidant activity was measured by the capacity of tissue supernatants to inhibit peroxide formation when added to rat liver homogenate. Blood, ascitic fluid, intestinal mucosa, and bone marrow had the highest antioxidant activity. Testis and spleen had less, and liver and brain had none. Peroxide formation in this test system was inhibited by citrate and EDTA.  $FeCl_3$  and low concentrations of ascorbic acid were catalytic.

Whole-body x-irradiation (800 r) destroyed the antioxidant activity of the mucosa but had no effect on that of other tissues. The mucosa from irradiated animals catalyzed peroxide formation in incubated methyl linolenate emulsions as well as in the liver homogenate. When tested by the inhibition of melanin formation, the antioxidant activity of irradiated mucosa was some-

what less than that of the unirradiated controls, but it never catalyzed this reaction.

Three graphs; 3 tables.

**The Effect of Single and Multiple Doses of  $Co^{60}$  Gamma-Radiation and Fission Neutron Radiation on the Incorporation of  $Fe^{59}$  into the Rat Erythropoietic System.** W. A. Rambach, J. A. D. Cooper, H. L. Alt, H. H. Vogel, Jr., J. W. Clark, and D. L. Jordan. *Radiation Res.* 10: 148-166, February 1959. (W. A. R., 303 E. Chicago Ave., Chicago 11, Ill.)

The investigation described here was concerned with the effect of both single and multiple doses of  $Co^{60}$   $\gamma$ -rays and fission neutrons on the distribution of  $Fe^{59}$  in rat plasma, bone marrow, red blood cells, liver, and spleen.

The irradiation caused a decreased incorporation of radioiron into the bone marrow and spleen, with a consequent decrease in the level of  $Fe^{59}$  in the peripheral red cells and an increase in the levels in plasma and liver iron. The mechanism of this redistribution is discussed.

From the data on acute exposure, with the incorporation of  $Fe^{59}$  into bone marrow as a biologic endpoint, an approximate relative biological effect of 1.0, fission neutrons to  $Co^{60}$   $\gamma$ -rays, is derived.

Repeated exposure to doses of neutron or  $\gamma$ -irradiation below 32 rads produced little or no immediate irreparable damage to the hematopoietic system. With both acute and chronic exposure there was a great propensity for recovery of the erythrocyte system. Higher doses of repetitive exposure, 81 rads and 150 rads, are, however, capable of producing change from which recovery is obviously slower. It is possible that some residual effect of radiation, at present not measurable, may exist which in the future will reveal itself in hematopoietic aberration.

Two photographs; 3 graphs; 5 tables.

## INDEX TO VOLUME 73

## A

**ABBATT, JOHN D., and LEA, A. J.:** Leukæmogens (ab), Sept., 494

**ABBOTT, WILLIAM E., KRIEGER, HARVEY, and LEVEY, STANLEY:** Technical surgical factors which enhance or minimize postgastrectomy abnormalities (ab), Aug., 301

**ABEL-HAKIM, M., and HIGAZI, A. M.:** Broncho-pulmonary amoebiasis (ab), Oct., 642

**ABDOMEN**  
See also names of abdominal organs and structures  
—“fat film” of abdomen (ab), Harry L. Arnold, Jr., and P. J. Washko, Sept., 484  
—primary retroperitoneal tumors (ab), F. Duval, Aug., 314

**ABEHOUSE, BENJAMIN S., and SALIK, JULIAN O.:** Pyelographic diagnosis of lesions of the renal papillae and calyces in cases of hematuria (ab), Sept., 481

**ABNORMALITIES AND DEFORMITIES**  
See also under organs and regions  
—adult agammaglobulinemia associated with multiple congenital anomalies (ab), Samuel Zelman and Hans Lewin, Oct., 662

**ABORTION**  
—cervical canal and abortion (ab), W. J. Rawlings, Aug., 312

**ABROUAV, JACOB. See CULINER, MORRIS M.**

**ABRAMS, HERBERT L.:** An approach to biplane cineangiocardiology. 3. Early clinical observations, Oct., 531  
The relationship of systemic venous anomalies to the paravertebral veins (ab), July, 134

**ABRODIL.** See Spine, intervertebral disks

**ABSCESS**  
See also Brain; Pancreas  
epidural  
—epidural tuberculous abscess simulating herniated lumbar intervertebral disk; case (ab), Henry G. Decker et al., Dec., 955

**ACETABULUM**  
—simple device for obtaining lateral acetabular views of hip in infants, Donald B. Darling, Sept., 432

**ACHONDROPLASIA**  
—achondroplasia of pelvis and lumbosacral spine: some roentgenographic features (ab), John Caffey, July, 144  
—chondrostrophy calcificans congenita (ab), Byron G. Brodgon and Neil E. Crow, July, 141

**ACID**  
fatty  
—cystic fibrosis of pancreas: intestinal absorption of fat and fatty acid labeled with  $I^{131}$  (ab), Keith Reemtsma et al., Oct., 652

folie. See Folic Acid Antagonists

nucleic. See Nucleins

**ACROMEGALY**  
—results of roentgen treatment of acromegaly; a clinical review (ab), Bengt Arner et al., Sept., 485

**ACTINOMYCIN**  
—potentiation of x-ray effects by actinomycin D, Giulio J. D'Angio, Sidney Farber and Charlotte L. Maddock, Aug., 175

**ACTINOMYCOSIS**  
—pulmonary actinomycosis (ab), Thomas A. Warthin and Boris Bushueff, Aug., 290

**ADAMS, ANDREW B. See GILROY, JAMES A.**

**ADAMS, FORREST H. See FINK, BURTON W.**  
—See MOSS, ARTHUR J.

**ADAMS, PAUL, JR. See KIELY, BRIAN**

**ADENOMA.** See Tumors, adenoma

**ADENOMATOSIS.** See Lungs, tumors

**ADIAO, AMPARO C. See DARGEON, HAROLD W.**

**ADOLESCENCE**  
—juvenile unicameral bone cyst: a roentgen reappraisal (ab), Gwilym S. Lodwick, July, 145

**ADRENALS**  
—suprenal glands in aortography (ab), Sven Ahlbäck, Aug., 314

**ADRENOCORTICAL PREPARATIONS**  
—effect of prednisolone in superficial radiation lesions of skin and mucosae (ab), R. L'Abbé et al., July, 156  
—growth of primate and nonprimate tissue culture cell lines in x-irradiated and cortisone-treated rats (ab), Lewis L. Coriell et al., Oct., 669  
—incidence of peptic ulcer among patients on long term prednisone therapy (ab), Lawrence E. Meltzer et al., Aug., 303  
—influence of cortisone on teratogenic activity of x-radiation (ab), D. W. M. Woollam et al., Nov., 838  
—x-ray manifestations of peptic ulceration during corticosteroid therapy of rheumatoid arthritis (ab), Theodore F. Hilbush and Roger L. Black, Aug., 303

**AGAMMAGLOBULINEMIA**  
—adult agammaglobulinemia associated with multiple congenital anomalies (ab), Samuel Zelman and Hans Lewin, Oct., 662

**AGE**  
See also Old Age  
—accuracy of radiological estimation of fetal age (ab), P. W. Verco, Oct., 659  
—influence of age on excretion of radioactive iodine (ab), G. A. MacGregor and H. Wagner, Sept., 489

**AGNEW, COLVIN H.:** Metastatic malignant melanoma of the kidney simulating a primary neoplasm. A case report (ab), Sept., 482

**AGNOS, JOHN W., and HOLMES, R. BRIAN:** Gas in the pancreas as a sign of abscess (ab), July, 141

**—and WOLLIN, D. G.:** The effect of rotation of the skull on the measured position of the pineal gland (ab), July, 129

**AGRANAT, V. Z.:** Accumulation of polonium ( $Po^{210}$ ) by water-living organisms (ab), Nov., 833

**AHERN, R. T.:** Tuberculosis of the femoral neck and greater trochanter (ab), July, 146

**AHLBÄCK, SVEN:** The suprarenal glands in aortography (ab), Aug., 314

**AIR CHUTES**  
—adaptation of air chutes to roentgen diagnostic departments, Ralph R. Greening and Ralph Lovelidge, Sept., 430

**AIR INSUFFLATION.** See Brain, roentgenography; Pneumography

**ALBERS-SCHÖNBERG'S DISEASE.** See Osteosclerosis fragilis

**ALBERT, CHALOM A. See ALBERT, SOLOMON N.**

**ALBERT, SOLOMON N., ECCLESTON, H. N., Jr., FUJITA, T., HUNTER, CHARLES H., and ALBERT, CHALOM A.:** Use of magnetic tape for recording radioactivity, Dec., 923

**ALIZARIN**  
—vital staining with alizarin in clinical malignant conditions of bone, S. Schorr, I. Aviad and A. Laufer, Sept., 410

**ALLEN, EDWARD P. See RYAN, ALLAN J.**

**ALLEN, WM. E., Jr.:** Hypaque sodium powder. A new gastrointestinal opaque (ab), Nov., 813

**ALPEN, EDWARD L., and BAUM, S. J.:** Modification of x-radiation lethality by autologous marrow infusion in dogs (ab), Oct., 669

—See DAVIS, A. K.

—See JACOBSEN, ELLY M.

**ALT, H. L. See RAMBACH, W. A.**

**AMAR, ARIAN D. See THOMPSON, IAN M.**

**AMDRUP, E., HJORTH, POVL, and JØRGENSEN, J. BALSLEV:** Radiological demonstration of variations in the fluid content of the small intestine during dumping attacks (ab), Aug., 304

**AMEBIASIS**  
—bronchopulmonary amoebiasis (ab), M. Abdel-Hakim and A. M. Higazi, Oct., 642

**AMERICAN BOARD OF RADIOLOGY**  
—announcements concerning examinations, Aug., 274; Sept., 455

**AMERICAN UROLOGICAL ASSOCIATION**, award, July, 115

**AMNIOTIC FLUID**  
—studies to detect escape of amniotic fluid into maternal circulation during parturition (ab), Richard A. Sparr and Jack A. Pritchard, Sept., 491

**AMPLATZ, KURT. See GREENSPAN, RICHARD H.**

**ANDERSON, RAY C. See KIELY, BRIAN**

**ANDERSON, ROBERT M. See KAY, JEROME HAROLD**

**ANDREWS, HOWARD L.:** Species differences in response to high radiation doses (ab), Sept., 496

**ANEMIA**  
See also Sickle-Cell Disease  
—effect of anemia and transfusion polycythemia on phosphorus and iron uptake in erythrocyte precursors in rat bone marrow, studied by means of a triple tracer technique with  $P^{32}$ ,  $Fe^{59}$  and  $Cr^{51}$  (ab), Joseph P. Kriss et al., Dec., 962  
—splenectomy in hemolytic anemia: results predicted by body scanning after injection of  $Cr^{51}$ -tagged red cells (ab), Paul R. McCurdy and Charles E. Rath, Aug., 322  
—studies on anemia of tumor-bearing animals. I. Distribution of radioiron following injection of labeled erythrocytes (ab), Robert E. Greenfield et al., Sept., 492

**ANEURYSM**  
—large pseudoaneurysm caused by extrapleural plastic ball plombage (ab), Masahichi Kawano et al., Aug., 291

**aortic**  
—aneurysmal dilatation of aortic sinuses in coarctation of aorta; report of 2 new cases and review of literature (ab), Israel Steinberg and B. P. Sammons, Aug., 295  
—chronic dissecting aneurysm of aorta diagnosed by aortography (ab), H. H. G. Eastcott and David Sutton, Sept., 470  
—complete intrathoracic goiter simulating an aneurysm of ascending aorta; case (ab), John B. Codington and R. Adams Cowley, Aug., 292

**ANEURYSM**—*cont.*

- arteriovenous. See Fistula, arteriovenous
- carotid
  - occluding dissecting aneurysm as complication of carotid angiography (ab), Kjell Liverud, Nov., 808
  - cerebral
    - some aspects of subarachnoid hemorrhage—a symposium. I. Clinical and surgical aspects of ruptured intracranial aneurysms (ab), Wylie McKissock, Dec., 937
    - some aspects of subarachnoid hemorrhage—a symposium. II. Intracranial aneurysms—pathological aspects (ab), T. Crawford, Dec., 937
    - some aspects of subarachnoid hemorrhage—a symposium. III. Accuracy of radiology in demonstrating ruptured intracranial aneurysms (ab), L. V. Perrett and J. W. D. Bull, Dec., 937
    - subarachnoid hemorrhage: prognosis when angiography reveals no aneurysm. Report of 138 cases (ab), Ollie Höök, Sept., 463
  - coronary
    - congenital aneurysm of coronary artery with arteriovenous fistula (ab), Troels Munkner et al., Aug., 294
    - congenital aneurysms of coronary arteries, with report of case (ab), Ira Gore et al., Dec., 948
  - of ductus arteriosus. See Ductus Arteriosus
  - renal
    - aneurysm of renal artery (ab), R. D. Sproul et al., July, 134
    - aneurysm of renal artery; 5 cases (ab), Benedict R. Harrow and Jack A. Sloane, Nov., 809
  - splenic
    - aneurysm of splenic artery (ab), W. C. Shands and J. Harvey Johnston, Jr., Oct., 647

**ANGIACARDIOGRAPHY.** See Cardiovascular System; Heart, abnormalities

**ANGIOGRAPHY.** See Arteries; Brain, blood supply; Heart; Kidneys; Lungs; Pelvis; etc.

**ANGIOMA.** See Tumors, angioma

**ANGIOPLASTY.** See Coronary Vessels

**ANKLE**
  - observations of neuropathic (Charcot) joints occurring in diabetes mellitus (ab), Julian E. Jacobs, Aug., 310

**ANLYAN, W. G.** See ISLEY, J. K., JR.

**ANTHRACOSILICOSIS.** See Pneumoconiosis

**ANTIBIOTICS**
  - usefulness of contrast medium containing an antibacterial agent (Retrograffin) for retrograde pyelography (ab), Joseph Bloom and J. F. Richardson, Dec., 954

**ANTIBODIES**
  - comparison of effects of radioactive internal emitters and x-rays on antibody formation (ab), Paul R. Salerno and Hymer L. Friedell, Sept., 500

**ANTRUM.** See Pylorus; Stomach, inflammation

**AORTA**
  - anomalous artery (arising from aorta) in intralobular bronchopulmonary sequestration; 2 cases demonstrated by angiography (ab), Franklyn P. Gerard and Harold A. Lyons, Aug., 299
  - examination of thoracic aorta and left ventricle by intraventricular catheterization via femoral artery (ab), G. Bonte et al., Aug., 298
  - five-year observations on unsupported fresh venous grafts of aorta in dogs (ab), John E. Jerssoph et al., Sept., 470
  - hypoplasia of aorta; case (ab), Kalevi Pyörälä et al., Dec., 944
  - suprasternal transaortic coronary arteriography (ab), William M. Lemmon et al., Nov., 807

**abnormalities**
  - corrected transposition of great vessels of heart (ab), J. A. Kernen, Oct., 645
  - kinking of aortic arch (ab), B. F. Vaughan, Oct., 645

**aneurysm.** See Aneurysm, aortic

**coarctation.** See Aorta, stenosis

**roentgenography.** See also Aneurysm, aortic; other sub-heads under Aorta

  - abdominal aortography (ab), Owings W. Kincaid and George D. Davis, Sept., 470
  - aortic valvular diseases studied by percutaneous thoracic aortography (ab), Per Ödman and Jan Philipson, Sept., 469
  - contribution to technic of aortography (ab), H. Brasche, July, 135
  - renal function after aortography with large contrast medium doses; experimental study in dogs (ab), N. P. G. Edling et al., Sept., 470
  - role of aortography in determination of operability in arteriosclerosis of lower extremities (ab), Edwin J. Wylie and Leon Goldman, July, 133
  - slow injection method of aorto-arteriography (ab), André J. Bruwer and F. Henry Ellis, Jr., July, 135
  - suprarenal glands in aortography (ab), Sven Ahlbäck, Aug., 314
  - suprasternal thoracic aortography: suprasternal trans-thoracic needle puncture opacification of thoracic aorta, J. Stauffer Lehman, William M. Lemmon, Randal A. Boyer and Edward A. Fitch, July, 18
  - unilateral renal injury due to translumbar aortography (ab), C. G. Clark, Aug., 298

**stricture**
  - aneurysmal dilatation of aortic sinuses in coarctation of aorta; report of 2 new cases and review of literature (ab), Israel Steinberg and B. P. Sammons, Aug., 295
  - aortic stenosis in infants and children (ab), Patrick A. Ongley et al., July, 132
  - coarctation of aorta: aortographic studies before and after operation (ab), Bror Brodén and Johan Karnell, Aug., 294

**AORTIC VALVE**
  - aortic valvular diseases studied by percutaneous thoracic aortography (ab), Per Ödman and Jan Philipson, Sept., 469
  - tomography of calcified aortic and mitral valves (ab), Paget Davies and N. L. Buckley, Nov., 805

**ORTHOGRAPHY.** See Aneurysm, aortic; Aorta

**APPENDICITIS.** See Appendix

**appendix**
  - mucocele of appendix, with special reference to diagnosis with double contrast method (ab), P. Bertil Norberg
  - and Bruno Samenius, Sept., 475

**calculi**
  - acute appendicitis following retention of barium in appendix (ab), Millington O. Young, Oct., 651
  - coproliths (calcified appendiceal calculi) in children (ab), Frank C. Stiles, Oct., 651

**AQUEOUS HUMOR**
  - radiography of aqueous humor outflow (ab), Bruce E. Cohan, Aug., 287

**ARACHNOIDACTYLYA**
  - Marfan's syndrome, with special reference to congenital enlargement of spinal canal (ab), J. D. Nelson, Aug., 310

**ARANDA, S.** See ESPINO-VELA, J.

**ARCOMANO, JOSEPH P.** See BARNETT, JAMES C.

**ADDRAN, G. M., and KEMP, F. H.:** Radium poisoning: two case reports (ab), Sept., 495

**ARGENTINA**
  - brucellosis and echinococcosis in Argentina: a short clinical and radiological report (ab), H. H. Weber, Aug., 315

**ARNER, BENGT, LINDGREN, MARTIN, and LINDQVIST, BENGT:** Results of roentgen treatment of acromegaly. A clinical review (ab), Sept., 485

**ARNOLD, HARRY L., JR., and WASHKO, P. J.:** "Flat film" of the abdomen (ab), Sept., 484

**ARTERIES**
  - See also Aneurysm; Aorta; Arteriosclerosis; Cardiovascular System; Lungs, blood supply; etc.
  - vascular syndromes from dilatation of arteriovenous communications of sole of foot (ab), Edmond Malan, Sept., 472

**brachial**
  - vertebral arteriography by percutaneous brachial artery catheterization (ab), F. Pygott and C. F. Hutton, Dec., 938

**carotid.** See also Thrombosis
  - avoidance of false angiographic localization of site of internal carotid occlusion (ab), Francis Murphy and John Shillito, Jr., Nov., 800
  - blood pressure changes in cerebral arteries during carotid angiography with Umbradil (ab), Ulf Söderberg and Nils Weckman, July, 128
  - cerebral angiographic contrast media: a comparison of Hypaque 45% and Urograffin 60% and an assessment of the relative clinical toxicity of Urograffin 60%, Hypaque 45%, Diaginol 25% and Diiodine 35% in carotid arteriography (ab), A. T. Broadbridge and E. V. Leslie, Aug., 286
  - cerebral angiography: a new technic. Catheterization of common carotid artery via superficial temporal artery (ab), Israel H. Weiner et al., Sept., 463
  - observations on hemiplegia with middle cerebral artery trunk occlusions and with "normal" carotid angiograms (ab), J. E. Webster and E. S. Gurdjian, July, 128
  - occluding dissecting aneurysm as complication of carotid angiography (ab), Kjell Liverud, Nov., 808
  - sign of early regional venous opacification in rapid carotid serial angiography (ab), E. Woringer et al., July, 136
  - technic for arteriography of external carotid artery (ab), Giovanni Ruggiero and Maurice Jay, Sept., 465
  - technic in percutaneous carotid and vertebral angiography with polyethylene catheters (ab), Kjell Liverud, Nov., 808

**celiac**
  - percutaneous selective angiography of celiac artery (ab), Per Ödman, Aug., 298

**cerebral.** See also Aneurysm, cerebral
  - blood pressure changes in cerebral arteries during carotid angiography with Umbradil (ab), Ulf Söderberg and Nils Weckman, July, 128
  - observations on hemiplegia with middle cerebral artery trunk occlusions and with "normal" carotid angiograms (ab), J. E. Webster and E. S. Gurdjian, July, 128
  - communicating
    - circulation through posterior communicating artery in different compression tests; preliminary report (ab), Georg-Fredrik Saltzman, Nov., 808

**coronary.** See Coronary Vessels

## ARTERIES—cont.

  femoral  
    examination of thoracic aorta and left ventricle by intraventricular catheterization via femoral artery (ab), G. Bonte et al, Aug., 298  
    skin necrosis complicating femoral arteriography (ab), D. S. Botseas and G. H. Lawrence, Nov., 809  
  mesenteric  
    percutaneous selective angiography of superior mesenteric artery (ab), Per Odman, Nov., 809  
  occlusion. See Thrombosis; other subheads under Arteries  
  pulmonary  
    anomalous left coronary artery arising from pulmonary artery (ab), William J. Kuzmar et al, Nov., 806  
    cardiac dextroposition: hypoplasia of right pulmonary artery with right venous pulmonary drainage into inferior vena cava (ab), M. Tornier-Soler et al, July, 132  
    congenital absence of main branch of pulmonary artery; report of 3 new cases associated respectively with bronchietasis, atrial septal defect and Eisenmenger's complex (ab), Israel Steinberg, Aug., 293  
    corrected transposition of great vessels of heart (ab), J. A. Neren, Oct., 645  
    pulmonary hypertension due to pulmonary arterial coarctation, Karl H. Falkenbach, Norman Zheudlin, Andrew H. Dowdy and Bernard J. O'Loughlin, Oct., 575  
  renal. See also Aneurysm, renal  
    hypertension in unilateral renal artery stenosis with arteriovenous fistula: arteriographic demonstration in 18-year-old male (ab), G. Gollmann, July, 135  
    internal diameter of renal artery and renal function (ab), N. S. Maluf, Aug., 299  
  roentgenography. See also Brain, blood supply; Fistula, arteriovenous; Thrombosis; other subheads under Arteries; etc.  
    angiography in soft-tissue hemangiomas (ab), Osborne Bartley and Ingmar Wickbom, Dec., 945  
    angiography and cardioangiography (ab), S. B. Feinberg, July, 136  
    slow injection method of aorto-arteriography (ab), André J. Bruwer and F. Henry Ellis, Jr., July, 135  
  splenic. See Aneurysm, splenic  
  temporal  
    cerebral angiography: a new technic. Catheterization of common carotid artery via superficial temporal artery (ab), Israel H. Weiner et al, Sept., 463  
  uterus  
    roentgenologic interpretation and uses of percutaneous retrograde pelvic arteriography (ab), Billy P. Sammons et al, Aug., 311  
  vertebral  
    circulation through posterior communicating artery in different compression tests; preliminary report (ab), Georg Fredrik Saltzman, Nov., 808  
    posterior fossa arteriovenous aneurysm with occlusion of a vertebral artery (ab), Robert D. Teasdall, July, 129  
    technic in percutaneous carotid and vertebral angiography with polyethylene catheters (ab), Kjell Liverud, Nov., 808  
    vertebral arteriography by percutaneous brachial artery catheterization (ab), F. Pygott and C. F. Hutton, Dec., 938  
    vertebral arteriography in neurosurgical diagnosis (ab), G. Ruggiero et al, Aug., 286  
ARTERIOGRAPHY. See Arteries; Bones, blood supply; Coronary Vessels; Lungs, blood supply; Stomach, blood supply; etc.

## ATHEROSCLEROSIS

  applicability of angioplastic procedures in coronary atherosclerosis: an estimate through postmortem injection studies (ab), D. Emerick Szilagyi et al, July, 134  
  radiology's responsibility to the atherosclerotic (ab), Neil E. Crow and Byron G. Brogdon, July, 133  
  role of aortography in determination of operability in arteriosclerosis of lower extremities (ab), Edwin J. Winkler and Leon Goldman, July, 133  
ARTHRITIS. See Arthritis, Rheumatoid; Hip; Spine; etc.

## ARTHRITIS, RHEUMATOID

  comparative radiological study of Reiter's disease, rheumatoid arthritis and ankylosing spondylitis (ab), R. M. Mason et al, Dec., 949  
  Nisbet symposium: collagen disease. Part 2. The arthritides (ab), Phyllis B. E. Goatcher, Oct., 662  
  Nisbet symposium: collagen disease. Part 3. The radiological changes (ab), B. F. Vaughan, Oct., 663  
  spontaneous dislocation of atlanto-axial articulation occurring in ankylosing spondylitis and rheumatoid arthritis (ab), T. L. C. Pratt, Nov., 801  
  x-ray manifestations of peptic ulceration during corticosteroid therapy of rheumatoid arthritis (ab), Theodore F. Hilbush and Roger L. Black, Aug., 303

## ARTHROGRAPHY. See Hip

  ARVIDSSON, HÅKAN: Angiographic observations in mitral disease with special reference to volume variations in the left atrium (ab), Aug., 296  
ASCITES  
  clinical evaluation of radioactive chrome phosphate in control of malignant pleural and ascitic effusions, Charles R. Perryman, Edward J. Pavsek and John D. McAllister, Dec., 865

  combined effect of radiogold and nitrogen mustard and radiogold and certain other compounds on Ehrlich ascites carcinoma (ab), Richard W. Whitehead et al, Oct., 666

ÄSHEIM. See EDLING, N. P. G.

ASPERGILLOMA. See Aspergillosis

ASPERGILLOSIS

  pulmonary aspergillosis (ab), Paul F. Hausmann, Oct., 642

  so-called aspergillosis (ab), A. Brunner, Aug., 291

ASTER, RICHARD H. See LOWREY, GEORGE H.

ASTROCYTOMA. See Tumors, astrocytoma

ATELECTASIS. See Lungs, collapse

ATHANASIU, MIRCEA. See BLATT, NICOLAS

ATHEROSCLEROSIS. See Arteriosclerosis

ATKINSON, RAY C. See HUTCH, JOHN A.

ATLAS and AXIS

  neurological syndromes associated with congenital absence of odontoid process (ab), L. P. Rowland et al, July, 129

  spontaneous dislocation of atlanto-axial articulation occurring in ankylosing spondylitis and rheumatoid arthritis (ab), T. L. C. Pratt, Nov., 801

AUSTRIAN, SOL. See SWAIMAN, KENNETH F.

AVIAD, I. See SCHORR, S.

AWWAD, H. K. See MASSOUD, G. E.

AXIS. See Atlas and Axis

AZZATO, NICHOLAS M. See WEINER, ISRAEL H.

## B

BACK. See Backache; Spine

BACKACHE

  diagnosis in low back pain and sciatica: analysis of 73 operated cases (ab), Sverker Nordlander et al, Nov., 817

BAGNALL, H. J., BENDA, P., BROWNELL, G. L., and SWEET, W. H.: Positron-scanning with copper-64 in the diagnosis of intracranial lesions: partition of copper-64 versenate in, and excretion from, the body (ab), Sept., 488

BAGSHAW, MALCOLM A. See KALLMAN, ROBERT F.

BAL, ANGEL F. See BREWER, LYMAN A., III

BAILY, NORMAN A., and NOELL, WERNER K.: Relative biological effectiveness of various qualities of radiation as determined by the electroretinogram (ab), Sept., 498

BAJAJ, I. D.: Different stages of radiological epiphysial union (ab), Aug., 310

BAKER, D. G., and HUNTER, C. G.: The early gastrointestinal response in the rat exposed to whole-body x-irradiation (ab), Nov., 837

BAKER, ORLAND. See CHAPMAN, CARLETON B.

BAKER, PAUL T., and SCHRAER, HARALD: The estimation of dry skeletal weight by photometry of roentgenograms (ab), July, 149

BAKER, S. J. See PATERSON, D. E.

BAKER, SOL R.: Orthovoltage therapy. Is there still a need for it? (ab), Oct., 663

BAKER, WILLIAM J., LUTERBECK, EUGENE F., GRAF, EDWIN C., CALLAHAN, DANIEL H., and FIRFER, RAYMOND: A new method for handling radioactive gold in the treatment of prostatic cancer (ab), July, 152

BALAGUER-VINTRO, I. See TORNER-SOLER, M.

BALDWIN, LOUIS. See HARPER, PAUL V.

BALKISOON, BASDEO, JOHNSON, JOHN B., BARBER, JESSE B., and GREENE, CLARENCE S.: Cerebral arteriography—diagnostic value in cerebrovascular disease (ab), Dec., 937

BANK, HARRY. See MARBERG, KURT

BANKS, G. B.: Television pick-up tubes for x-ray screen intensification (ab), Sept., 484

BANTUS. See Negroes

BARACCHI, FRANCO. See LENZI, MARIO

BARBER, ALBERT A., and WILBUR, KARL M.: The effect of x-irradiation on the antioxidant activity of mammalian tissues (ab), Dec., 966

BARBER, JESSE B. See BALKISOON, BASDEO

BARBORKA, CLIFFORD J. See VANTRAPPEN, GASTON

BARCIA, A. See FIANDRA, O.

BARIUM. See also Intestines, roentgenography; Intussusception  
  barium meal and follow-through (ab), A. C. Glendinning, Sept., 473

  fatal venous intravasation of barium during a barium enema, Lee S. Rosenberg and Archie Fine, Nov., 771

BARKER, HAROLD G. See REEMTSMA, KEITH

BARNETT, JAMES C., and ARCOMANO, JOSEPH P.: Hip arthrography in children, with Renografin, Aug., 245

BARON, JULIUS G. See PETERSON, RICHARD E.

BARRETT, N. R.: Idiopathic mediastinal fibrosis (ab), Sept., 467

BARTLEY, OSBORNE, and WICKBOM, INGMAR: Angiography in soft tissue hemangiomas (ab), Dec., 945

BASES, ROBERT, PEARLMAN, ALEXANDER, ROSH, RIEVA, and RUBENFELD, SIDNEY: Attempts at modification of the radiation response of neoplasms by the administration of "hematoporphyrin" (ab), Oct., 668

BASU, SATYEN: Radiological aspects of new growths of the larynx (ab), Aug., 288

BATCHELOR, A. L. See BEWLEY, D. K.

**BAUM, GERHART:** Various practical methods of grid therapy (ab), Sept., 487

**BAUM, S. J.** See ALPEN, EDWARD L.

**BAUMGARTNER, J.** See WORINGER, E.

**BAYLIN, G. J.** See ISLEY, J. K., Jr.

—See REEVES, R. J.

**BEAHR, OLIVER H., and SCHMIDT, HERBERT W.** Dysphagia caused by hypertrophic changes in the cervical spine. Report of two cases (ab), Dec., 950

**BECHTEREW'S DISEASE.** See Spine, arthritis

**BECK, G.** Postoperative x-ray findings following cardia resection and gastrectomy (ab), Oct., 649

**BECK, J. SWANSON:** Acute radiation nephritis in childhood (ab), Aug., 326

**BECKER, ALAN B., and BENJAMIN, H. B.:** New concept of the small intestine vascular pattern (ab), Dec., 947

—See BENJAMIN, H. B.

**BECKER, JOSEF, and SCHEER, KURT ERNST:** The betamosaic: an adaptable radiation source for superficial radiation therapy (ab), July, 152

**BEETLESTONE, A., and THURMER, G.:** Some considerations of focal spot sizes (ab), July, 149

**BEGG, CHARLES F.** See BELL, A. L. LOOMIS, Jr.

**BEGLEY, M. D.:** Symposium: myelography in the diagnosis of diseases of the spinal canal. Part 2: Diseases of the spinal cord and its covering with special reference to the application of myelography (ab), Oct., 657

**BEHRER, M. REMSEN.** See GOLDRING, DAVID

**BEIERWALTES, WILLIAM H.** See LOWREY, GEORGE, H.

**BELCHER, E. H., HARRISS, EILEEN B., and LAMERTON, L. F.:** Turnover studies with  $^{59}\text{Fe}$  in the x-irradiated rat (ab), Sept., 492

**BELL, A. L. LOOMIS, Jr., SHIMOMURA, SEIICHI, GUTHRIE, W. JAMES, HEMPEL, HERBERT F., FITZPATRICK, HUGH F., and BEGG, CHARLES F.:** Wedge pulmonary arteriography. Its application in congenital and acquired heart disease, Oct., 566

**BELL, H. GLENN.** See SHELINE, GLENN E.

**BELL, JOHN W.:** Experimental pulmonary emphysema. Production of emphysematous bullae in the rabbit by infection with tuberculosis (ab), Oct., 644

**BELLMAN, SVEN, and ÖDEN, BO:** Regeneration of surgically divided lymph vessels. An experimental study on the rabbit's ear (ab), Nov., 821

**BELTRANDO, L.** See REBOUL, G.

**BENDA, P.** See BAGNALL, H. J.

**BENEDICT, EDWARD B.** See SHAMMA'A, MUNIR H.

**BENJAMIN, H. B., and BECKER, ALAN B.:** A vascular study of the small intestine (ab), Dec., 947

—See BECKER, ALAN B.

**BENJAMIN, JOHN A.:** The use of x-ray cinematography in pathological studies (ab), Nov., 820

**BENKENDORF, CHARLES.** See PAUL, LESTER W.

**BENNETT, LESLIE R.** See HUTCHINSON, DONALD L.

—See MENA, ISMAEL

**BERANBAUM, SAMUEL L., and JACOBSON, HAROLD G.:** Right angle roentgenography of the gastrointestinal tract (ab), Oct., 648

**BERCY, A.:** Irradiation of tumors with gold seeds. Simplification of calculation, (ab), Sept., 491

—See DELFERIERE, A.: Theoretical study of dosage and geometric distribution of radioactive gold seeds in interstitial radiotherapy (ab), Sept., 491

**BERG, NILS O., and LINDBERG, MARTIN:** Time-dose relationship and morphology of delayed radiation lesions of the brain in rabbits (ab), Sept., 499

**BERGER, M.** See SCHWARZ, E.

**BERGER, SIMON M., INGLEBY, HELEN, and GERSHON-COHEN, J.:** Roentgenography and biopsy in mammary cancer, Dec., 891

**BERGMAN, PER, and WEHLIN, LENNART:** The hystero-graphic appearance of cystic glandular hyperplasia (ab), July, 146

**BERIBERI** —beriberi heart disease (ab), Reverdy H. Jones, Jr., Dec., 943

—physiological studies on beriberi heart disease by injection of radioactive material (ab), R. Lessard et al., Nov., 834

**BERKMEN, Y.** See SOTEROPoulos, C.

**BERNATZ, PHILIP E., BURNSIDE, ALFRED F., Jr., and CLAGETT, O. THERON:** Problem of the ruptured diaphragm (ab), Aug., 309

**BERNIER, J. P.** See LESSARD, R.

**BERNSTINE, RICHARD L.** See SIMMONS, BILLY P.

**BERRIDGE, F. R., and GREGG, D. McC.:** The value of cinematography in the diagnosis of malignant strictures of the oesophagus (ab), July, 137

**BERSACK, SOLOMON R., HOWE, JOHN S., and RABSON, ALAN S.:** Inflammatory pseudopolypsis of the small and large intestines with the Peutz-Jeghers syndrome in a case of diffuse histoplasmosis (ab), July, 139

**BESSLER, W.:** Changes in the chest roentgenogram in collagen diseases (ab), Oct., 643

**BETA MOSAIC.** See Radioactivity, radioyttrium

**BETA RAYS.** See Electrons; Radioactivity, radiostrontium; Radioactivity, radioyttrium

**BEWLEY, D. K., BATCHELOR, A. L., LOWE, J., NATA-ADIDJAJA, E., NEWBERRY, G. R., and OPIE, R.:** Integral doses at 200 kV and 8 MeV (ab), Dec., 959

**BHATTACHARYYA, A. K., and PATERSON, D. E.:** Use of barium tannic acid enema in investigation of large intestine (ab), Aug., 306

**BILE** —role of bile secretion in gastrointestinal radiation syndrome (ab), Kenneth L. Jackson and Cecil Entenman, Nov., 838

**BILE DUCTS** —See also Biliary Tract

—syndrome of cystic duct (ab), F. Raboni, Aug., 307

**abnormalities.** See also Bile Ducts, cysts

—developmental basis for bile duct anomalies (ab), Mark A. Hayes et al., Aug., 308

**cysts** —congenital choledochal cyst: demonstration by oral cholecystography (ab), LaMar J. Hankamp, Nov., 814

—congenital cystic dilatation of common duct (ab), Carlos Payet G., July, 141

—roentgenographic study of congenital choledochal cysts: pre- and postoperative analysis of 5 cases (ab), Edwin J. Liebner, Oct., 654

**dilatation.** See Bile Ducts, cysts

**roentgenography.** See also Bile Ducts, cysts

—diagnostic value of intravenous cholangiography during acute cholecystitis and acute pancreatitis (ab), Henry C. Johnson, Jr., et al., Nov., 814

—false negative shadows in intravenous cholangiography (ab), Eric Samuel and Walter Scott, Sept., 476

—movements of common bile duct in man: studies with image intensifier (ab), W. Burnett and R. Shields, Sept., 475

—radiologic diagnosis of hypertension of sphincter of Oddi, and of cystic duct disease (ab), Lido G. Mosca, Oct., 653

—side-effects of Biligrafina Forte (ab), Georg-Friedrich Salzman, Dec., 949

—significance of preoperative cholangiography in management of gallbladder disease (ab), P. A. Ykelman, Sept., 476

**BILARY TRACT** —See also Bile Ducts; Gallbladder; Liver diseases

—serial cholecystography: a means of preoperative diagnosis of biliary dyskinesia (ab), J. Dudfield Rose, Nov., 813

**fistula.** See Fistula, biliary

**roentgenography.** —cholecystocholangiography with cholecystokinin (ab), A. J. Ch. Haex and D. Limburg, Aug., 308

**BILIGRAFIN.** See Bile Ducts; Gallbladder

**BIOLGY.** See Radiations, effects; Radiobiology; Roentgen Rays, effects

**Biopsy.** See Breast, cancer

**BIRCHALL, I. See STAFFURTH, J. S.**

**BIRKHAUSER, H.:** Suspicion of lung cancer (ab), Sept., 467

**BISHOP, COURTNEY C.** See HAYES, MARK A.

**BISHOP, HARRY A., WEBBER, MILO, and O'LOUGH-LIN, BERNARD J.:** Reducing gonad irradiation in gynaecological diagnosis (ab), Dec., 964

**BLACK, ROGER L.** See HILBISH, THEODORE F.

**BLACKMAN, JAMES, CANTRIL, SIMEON T., LUND, PAUL K., and SPARKMAN, DONAL:** Tracheobronchial papillomatosis treated by roentgen irradiation. Report of two cases, Oct., 598

**BLADDER** —See also Cystitis; Urinary Tract

—functional characteristics of ileal segment as a valve (ab), Frank Hinman, Jr., and Rudolf Oppenheimer, Nov., 820

**cancer** —neoplasms of female urinary bladder (ab), C. Bernard Brack et al., Nov., 826

—supervoltage irradiation in carcinoma: 1952-1958, Philip Rubin and Robert Burai, Aug., 209

—supervoltage (2-Mvp) rotation irradiation of cancer, Milton Friedman, Aug., 191

**diverticula** —transperitoneal removal of certain vesical diverticula and a radiographic technic for diagnosis (ab), L. N. Pyrah and P. G. Keates, Oct., 659

**obstruction** —classification of urographic patterns in children with congenital bladder neck obstruction (ab), Aurelio C. Usón et al., Sept., 482

**regurgitation from** —new test for vesico-ureteral reflux: an external technic using radioisotopes (ab), Chester C. Winter, Nov., 820

—occurrence and significance of vesico-ureteral reflux in children (ab), W. I. Forsythe and R. F. Whelan, Oct., 660

**roentgenography.** See also other subheads under Bladder

—delayed cystography: a valuable diagnostic tool (ab), William H. Browning et al., Nov., 820

—micturition cysto-urethrography: automatic serial technic (ab), C. E. Gudbjerg et al., July, 147

—screening urethrocystography of adult Bantu males under manometric control: normal and pathological findings (ab), T. Richard, Dec., 953

—Thixoxon cystourethrography (ab), James F. Glenn, Aug., 314

—views on value of urethrocystography in determining indications for surgery in prostatic hypertrophy (ab), Hans Ekman, Sept., 483

**BLADDER—cont.**  
 tumors  
 —tantalum 182 in treatment of bladder tumors (ab), Gösta Jonsson et al., Sept., 492

**BLAINE, EDWARD SMITH** (obit), Aug., 272

**BLAIR, D. W.** See **FORREST, A. P. M.**

**BLAKEMORE, WILLIAM S.** See **ROCHLIN, DONALD B.**

**BLAND-WHITE-GARLAND SYNDROME.** See **Coronary Vessels**

**BLASTOMYCOSIS**  
 —roentgen aspects of blastomycosis (ab), W. L. Boswell, Dec., 955

**BLATT, NICOLAS, and ATHANASIU, MIRCEA:** Changes in the optic canal in tumors of the optochiasmatic region (ab), Oct., 638

**BLAZISK, CHARLES.** See **MAYER, EDGAR**

**BLEDSOE, R. C., and IZENSTARKE, J. L.:** Displacement of fat pads in disease and injury of the elbow. A new radiographic sign, Nov., 717

**BLOMFIELD, G. W., ECKERT, H., FISHER, MONICA, MILLER, H., MUNRO, D. S., and WILSON, G. M.:** Treatment of thyrotoxicosis with  $I^{131}$ . A review of 500 cases (ab), Dec., 959

—See **WILSON, G. M.**

**BLOOD**  
 See also **Anemia**; **Eosinophils**; **Erythrocytes**; **Hemopoietic System**; **Leukemia**; **Leukocytes**; etc.  
**circulation.** See also **Arteries**, **communicating**; **Embolism**; **Femur**, **blood supply**; **Lungs**, **blood supply**; etc.  
 —congenital atresia of inferior vena cava, common iliac veins, and left innominate vein; case with extensive development of superficial venous collateral circulation (ab), Kenneth F. Swaiman et al., Aug., 294  
 —determination of cardiopulmonary circulation time by external scintillation counting (ab), Ismael Mena et al., Nov., 833  
 —some clinical aspects of isotope circulation studies, Richard H. Greenspan, Richard G. Lester, James F. Marvin and Kurt Amplatz, Sept., 345  
 —studies to detect escape of amniotic fluid into maternal circulation during parturition (ab), Richard A. Sparr and Jack A. Pritchard, Sept., 491  
**fat and lipoids**  
 —absorption, transport, and deposition of fat: application of new method for determination of  $I^{131}$ -lipid activity in dogs and man (ab), David A. Turner, July, 153  
**iodine**  
 —acute effect of organic binding of iodine on iodide concentrating mechanism of thyroid gland (ab), Seymour H. Wollman and Franklin E. Reed, July, 153  
 —effect of oral Lipiodol on thyroidal  $I^{131}$  uptake and serum protein-bound iodine concentration (ab), Anne C. Carter et al., Dec., 960  
 —significance of protein-bound radioactive iodine determination in hyperthyroidism (ab), J. S. Staffurth and I. Birchall, Nov., 830  
**plasma.** See **Blood**, **proteins**  
**platelets.** See **Thrombocytopenia**  
**proteins.** See also **Blood**, **iodine**  
 —plasma protein-thyroid hormone complex in man. III. Further studies on use of the *in vitro* red blood cell of  $I^{131}$ -*L*-triiodothyronine as diagnostic test of thyroid function (ab), Milton W. Hamolsky et al., Nov., 829  
 —protein-bound iodine. See **Blood**, **iodine**  
**transfusion**  
 —effect of anemia and transfusion polycythemia on phosphorus and iron uptake in erythrocyte precursors in rat bone marrow, studied by means of a triple tracer technique with  $P^{32}$ ,  $Fe^{59}$  and  $Cr^{51}$  (ab), Joseph P. Kriss et al., Dec., 962  
 —supportive therapy to animals exposed to whole-body irradiation (ab), Creighton A. Hardin et al., Aug., 328

**BLOOD PRESSURE**  
 —blood pressure changes in cerebral arteries during carotid angiography with Umbradil (ab), Ulf Söderberg and Nils Weckman, July, 128  
 —high. See also **Lungs**, **blood supply**  
 —hypertension following x-irradiation of kidneys (ab), Clifford Wilson et al., Aug., 326  
 —hypertension in unilateral renal artery stenosis with arteriovenous fistula: arteriographic demonstration in 18-year-old male (ab), G. Gollmann, July, 135  
 —intra-ossous venography in portal hypertension (ab), Franz P. Lessmann and Robert Schobinger, Dec., 946  
 —pyelography in renal disease with hypertension: correlation between pyelographic findings and differential renal function studies, Lucy F. Squire and Jorgen U. Schlegel, Dec., 849

**BLOOD VESSELS**  
 See also **Aorta**; **Arteries**; **Cardiovascular System**; **Veins**; etc.  
 —Deuel's halo sign (ab), Olov F. Holm, Aug., 312  
 —intravascular gas in radiological diagnosis of fetal death in utero (ab), Paul Ross, Aug., 312

**BLOOM, JOSEPH, and RICHARDSON, J. F.:** The usefulness of a contrast medium containing an antibacterial agent (Retrografin) for retrograde pyelography (ab), Dec., 954

**BLOOMBERG, ALLAN E.** See **FELL, STANLEY C.**

**BLOOMFIELD, J. A.:** Half a century of progress in radio-diagnostic protection (ab), Dec., 964

**BOAG, J. W., DOLPHIN, G. W., and ROTBLAT, J.:** Radiation dosimetry by transparent plastics (ab), Nov., 827

**BOCKMAN, ALBERT A.** See **MELTZER, LAWRENCE E.**

**BOCKNER, V. Y.** See **POIDEVIN, L. O. S.**

**BODART, J.:** Albers-Schönberg's disease; report of 2 new cases (ab), Sept., 477

**BODY-SECTION ROENTGENOGRAPHY**  
 —clinical evaluation of nephrotomography (ab), W. F. W. Southwood and V. F. Marshall, Oct., 659  
 —intracranial pneumoangiography in the verticosubmental position: a neuroangiographic refinement (ab), W. Eugene Stern et al., July, 127  
 —tomographic analysis of depressed fractures within knee joint, and of injuries to cruciate ligaments (ab), Stig Fagerberg, Sept., 479  
 —tomography of calcified aortic and mitral valves (ab), Paget Davies and N. L. Bucky, Nov., 805  
 —tomography of temporal bone with polytome (ab), Ole Tarp, Dec., 938  
 —transverse laminography: the third dimension in body-section roentgenography: applications in radiation therapy (ab), Bernard Roswit et al., Dec., 955  
 —vascular pattern of lung as seen on routine and tomographic studies, Elliott Mellein and Julian O. Salik, Oct., 511

**BOLDON, EDWARD I.** See **HIBMA, OTTO V.**

**BOLT, ROBERT J.** See **WILBUR, RICHARD S.**

**BONARD, E. C.:** The lungs in scleroderma (ab), July, 130

**BOND, V. P., and EASTERDAY, O. D.:** Effects of heavy particle irradiation on acute mortality and survival time in the mouse (ab), Nov., 837

—See **WOLINS, W.**

**BONES**  
 See also **Cranium**; **Epiphyses**; **Spine**; **names of bones**  
 —estimation of dry skeletal weight by photometry of roentgenograms (ab), Paul T. Baker and Harald Schraer, July, 149  
 —radioactivity and human skeleton (ab), L. D. Marinelli, Sept., 494

**atrophy**  
 —osteoporosis of unknown cause in younger people: idiopathic osteoporosis (ab), W. P. U. Jackson, July, 142

**blood supply**  
 —arteriographic picture of metastatic bone disease (ab), Robert Schobinger, Oct., 655

**cancer**  
 —arteriographic picture of metastatic bone disease (ab), Robert Schobinger, Oct., 655  
 —vital staining with alizarin in clinical malignant conditions of bone, S. Schorr, I. Aviad and A. Laufer, Sept., 410

**composition**  
 —radiocalcium studies of bone formation rate in human metabolic bone disease (ab), Robert P. Heaney and G. Donald Whedon, Oct., 666

**cysts**  
 —juvenile unicameral bone cyst: a roentgen appraisal (ab), Gwilym S. Lodwick, July, 145  
 —radiation therapy of solitary benign cystic-appearing lesions involving long bones of children (ab), James C. Cook et al., July, 151  
 —solitary unicameral bone cyst in 7-week-old infant (ab), M. E. Tausend and Milton Marcus, Nov., 815

**disappearing.** See **Osteolysis**

**diseases.** See also **Bones**, **pathology**; **Osteitis**; etc.  
 —radiocalcium studies of bone formation rate in human metabolic bone disease (ab), Robert P. Heaney and G. Donald Whedon, Oct., 666

**fractures.** See **Calcaneus**; **Knee**; **Spine**

**growth.** See also **Epiphyses**  
 —cleidocranial dysostosis: report of 2 cases with special characteristics (ab), Johannes Thoms, Oct., 655  
 —rate of growth in length of long bones in certain pathological conditions (an x-ray study) (ab), L. Drey, Oct., 655  
 —retarding effect of protracted undernutrition on appearance of postnatal ossification centers in hand and wrist (ab), Samuel Dreizen et al., Oct., 655

**infarction**  
 —bone infarction (ab), N. L. Bucky, Nov., 815

**marrow**  
 —alteration of beta-radiation lesions of skin by cysteine, nitrite, hypoxia, spleen homogenate, and bone-marrow homogenate (ab), A. K. Davis et al., July, 160  
 —compatibility factors influencing acceptance of rat bone marrow graft by irradiated mouse (ab), J. W. Hollingsworth, Oct., 668  
 —effect of anemia and transfusion polycythemia on phosphorus and iron uptake in erythrocyte precursors in rat bone marrow, studied by means of a triple tracer technique with  $P^{32}$ ,  $Fe^{59}$  and  $Cr^{51}$  (ab), Joseph P. Kriss et al., Dec., 962  
 —effect of chemical protection and bone marrow treatment on radiation injury in mice (ab), Paul Ursu et al., July, 159  
 —effects of donor and host lymphoid and myeloid tissue injections in lethally x-irradiated mice treated with rat bone marrow (ab), George W. Santos and Leonard J. Cole, July, 159  
 —extraosseous infiltration in multiple myeloma, James A. Gilroy and Andrew B. Adams, Sept., 406

**BONES, marrow—cont.**

- intra-osseous venography in portal hypertension (ab), Franz P. Lessmann and Robert Schobinger, Dec., 946
- irradiation of entire body and marrow transplantation: some observations and comments (ab), E. Donnall Thomas et al, Dec., 963
- lethal whole-body irradiation: some experimental issues (ab), Peter Ilbery, Oct., 667
- modification of x-radiation lethality by autologous marrow infusion in dogs (ab), Edward L. Alpen and S. J. Baum, Oct., 669
- radiation injury and marrow replacement: factors affecting survival of the host and the homograft (ab), Joseph W. Ferree and E. Donnall Thomas, Sept., 497
- studies with transplantable AK4 mouse leukemia. III. Effect of spleen and marrow shielding on AK4 leukemic implants in homologous strains of irradiated mice (ab), Irene U. Boone et al, Aug., 328
- treatment of mouse lymphosarcoma by total-body x-irradiation and by injection of bone marrow and lymph-node cells (ab), M. J. de Vries and O. Vos, Nov., 837
- treatment of postirradiation hematopoietic depression in man by the infusion of stored autogenous bone marrow; preliminary observations (ab), N. B. Kurnick et al, Sept., 497
- value of intraosseous venography in tumors of female pelvis (ab), Franz P. Lessmann and Grace M. Waldrop, Oct., 648
- vertebral pedicle sign: a roentgen finding to differentiate metastatic carcinoma from multiple myeloma (ab), Harold G. Jacobson et al, Sept., 477
- osteolysis.** See *Osteolysis*
- osteomyelitis.** See *Femur, osteomyelitis*
- pathology**
- hemoglobin SC disease (bone changes) (ab), W. P. Cockshott, Aug., 309
- roentgen aspects of blastomycosis (ab), W. L. Boswell, Dec., 955
- tumors**
- radiation therapy of solitary benign cystic-appearing lesions involving long bones of children (ab), James C. Cook et al, July, 151
- roentgen therapy in Hand-Schüller-Christian and related diseases (ab), Bertel Jørgsholm, Sept., 487
- BONTE, FREDERICK J.** See *CHAPMAN, CARLETON B.*
- BONTE, G., CARON, J., PAUCHANT, M., and GÉRARD, A.**: Examination of the thoracic aorta and left ventricle by intraventricular catheterization via the femoral artery (ab), Aug., 294
- BOONE, IRENE U., ROGERS, BETTY S., and HARRIS, PAYNE S.**: Studies with transplantable AK4 mouse leukemia. III. Effect of spleen and marrow shielding on AK4 leukemic implants in homologous strains of irradiated mice (ab), Aug., 328
- BOOK REVIEWS**
- Aubin, A., et al. *L'œsophage: Actualités hépato-gastro-entérologiques de l'Hôtel-Dieu, 1957.* Edited by Guy Albot and Félix Poulleux, Aug., 280
- Beck, Hans R., Dresel, Hans, and Melching, Hans-Joachim. *Leitfaden des Strahlenschutzes für Naturwissenschaftler, Techniker und Mediziner*, Sept., 458
- Behrens, Charles F., editor. *Atomic Medicine*, Aug., 278
- Dijkstra, C. *Bronchography*, Nov., 793
- Goerttler, Klaus. *Normale und pathologische Entwicklung des menschlichen Herzens: Ursachen und Mechanismen typischer und atypischer Herzformbildungen dargestellt auf Grund neuer Befunde*, July, 118
- Golden, Ross, editor. *Diagnostic Roentgenology*. Renewal pages for Vols. I-III, Dec., 931
- Gotttron, H. A., and Schönfeld, W., editors. *Dermatologie und Venerologie: Einschließlich Berufskrankheiten, dermatologischer Kosmetik und Andrologie* in fünf Bänden. Band II/Teil 1: *Physikalische Behandlung, dermatologische Kosmetik*. Krankheiten noch unbekannter Herkunft nach ihrer Morphologie, Aug., 280
- Hedges, Fred Jenner, Lampe, Isadore, and Holt, John Floyd. *Radiology for Medical Students*, Aug., 279
- Holt, John Floyd, Hedges, Fred Jenner, Jaxow, Harold W., and Elgeman, Morton M., editors. *The Year Book of Radiology (1958-1959 Year Book Series)*, Oct., 622
- Homburger, Freddy, editor. *The Physiopathology of Cancer* by 32 Authors, Aug., 279
- Kjellberg, Sven R., Mannheimer, Edgar, Rudhe, Ulf, and Jonsson, Bengt. *Diagnosis of Congenital Heart Disease: A Clinical and Technical Study by the Cardiologic Team of the Pediatric Clinic, Karolinska Sjukhuset, Stockholm*, Dec., 931
- Lichtenstein, Louis. *Bone Tumors*, Aug., 277
- Lusted, Lee B., and Keats, Theodore E. *Atlas of Roentgenographic Measurement*, Dec., 930
- Meschan, Isadore. *An Atlas of Normal Radiographic Anatomy*, Dec., 930
- Medical Radiographic Technic, prepared by Technical Service, X-Ray Department, General Electric Company, Dec., 932
- du Mesnil de Rochemont, René. *Lehrbuch der Strahlenheilkunde: Behandlung mit Röntgenstrahlen und radioaktiven Substanzen*, Oct., 623
- Moss, William T. *Therapeutic Radiology: Rationale, Technique, Results*, July, 116
- Nassim, Reginald, and Burrows, H. Jackson, editors. *Modern Trends in Diseases of the Vertebral Column*, July, 117
- Pack, George T., and Ariel, Irving M., editors. *Treatment of Cancer and Allied Diseases*. Volume I: *Principles of Treatment by Fifty-Five Authors*. Volume II: *Tumors of the Nervous System by Thirty Authors*. Volume III: *Tumors of the Head and Neck by Seventy Authors*, Aug., 277
- Reboul, J., Guichard, R., Wangerme, Ch., Duhamel, J., and Delorme, G. *Technique radiologique: Guide du manipulateur; théorie et pratique*, July, 118
- Roussel, J. *Cliniques radiologiques: Première série: L'agrandissement radiographique direct dans l'examen de la base du crâne et des microfractures du rocher*, Nov., 193
- Schoen, Herbert, Bunde, Erich, Fromhold, Walter, Loeck, Viktor, and Schoen, Detlev, editors. *Medizinische Röntgentechnik: Lehrbuch für medizinisch-technische Assistentinnen, Ärzte und Studierende in zwei Teilen*, July, 117
- Scott, Wendell G., and Evans, Titus, editors. *Genetics, Radiobiology, and Radiology Proceedings*, Mid-Western Conference, Aug., 279
- Sonnenblick, B. P., editor. *Protection in Diagnostic Radiology*, Dec., 932
- Staehler, Werner. *Klinik und Praxis der Urologie: Klinik, Indikation, Diagnostik, operative und instrumentelle Eingriffe, Nachbehandlung*. Bände I and II, Dec., 932
- Vennes, Carol Hocking, and Watson, John C. *Patient Care and Special Procedures in X-Ray Technology*, Aug., 279
- Viallet, P., Sendra, L., Aubry, P., and Combe, P. *Angiocardiopneumographie clariée: Méthode d'opacification vasculaire générale par voie veineuse*, Nov., 794
- Wolf, Herman G. *Röntgendiagnostik beim Neugeborenen und Saugling*, Dec., 933

**BOOKS RECEIVED**

- Acute Radiation Syndrome: A Medical Report on the Y-12 Accident June 16, 1958.** ORINS-25, Sept., 456
- D'Aubigné, Merle, and Ramadier, J.-O. *Traumatismes anciens: Rachis, membre inférieur*, Sept., 457
- Billing, Lars, and Severin, Erik. *Slipping Epiphysis of the Hip: A Roentgenological and Clinical Study Based on a New Roentgen Technique*, Acta radiol. suppl. 174, July, 116
- Björk, Lars. *Cineradiographic Studies on the Fallopian Tubes in Rabbits*, Acta radiol. suppl. 176, July, 116
- Bloom, William L., Jr., Hollenbach, John L., Morgan, James A., and Thomas, John B., editors. *Medical Radiographic Technic*, Aug., 276
- Brocher, J. E. W. *Die Wirbelsäulenleiden und ihre Differentialdiagnose*, Oct., 622
- Carton, Charles A. *Cerebral Angiography in Management of Head Trauma*, Aug., 276
- Clark, Randolph Lee, Jr., and Cumley, Russell W., editors. *The Year Book of Cancer (1958-1959 Year Book Series)*, Sept., 456
- Claus, Walter D., editor. *Radiation Biology and Medicine: Selected Reviews in the Life Sciences*, July, 116
- Cocchi, U., and Thurn, P. *Einführung in die Röntgenodiagnostik*, Oct., 622
- Collected Statistics of Malignant Disease Seen at University College Hospital, London, During the Period 1946-1950, Sept., 457
- Contemporary Equipment for Work with Radioactive Isotopes: *Collected Reports*, Supplement No. 5 of the Soviet Journal of Atomic Energy, 1958, Oct., 622
- Dahl, Olov, and Wikterlöf, Karl Johan. *Dose Distributions in Arc Therapy in the 200 to 250 Kv Range: Systematic Measurements in Homogeneous Phantoms with the Beam Direction Perpendicular to the Oscillation Axis*, Acta radiol. suppl. 171, July, 116
- Dunham, Charles L. *Radioactive Fallout—A Two-Year Summary Report*, Nov., 793
- Ennis, LeRoy M., and Berry, Harrison M., Jr. *Dental Roentgenology*, Oct., 621
- Expert Committee on Health Statistics. *Sixth Report Including Third Report of the Subcommittee on Cancer Statistics*. World Health Organization Technical Report Series No. 164, July, 116
- Fossati, Franco, editor. *Quantities, Units and Measuring Methods of Ionizing Radiation. A Symposium (Rome, April 14-15, 1958)*, Nov., 792
- Frantz, Virginia Kneeland. *Tumors of the Pancreas. Atlas of Tumor Pathology, Section VII-Fasc. 27 and 28*, Nov., 793
- Friedman, Milton, Bruer, Marshall, and Anderson, Elizabeth, editors. *Roentgens, Rads, and Riddles*, Nov., 792
- Friedman, Nathan B., and Ash, James E. *Tumors of the Urinary Bladder. Atlas of Tumor Pathology, Section VIII-Fasc. 31*, July, 115
- Frik, Wolfgang. *Determinierbarkeit und Dosis bei der Röntgen durchleuchtung: Durchleuchtungsschirme und Bildverstärker*, Dec., 930
- Frik, Wolfgang, and Goering, Ulrich. *Röntgenanatomie für ärztliches Hilfspersonal und Röntgentechniker*, Sept., 457
- Fritz-Niggli, Hedi. *Strahlenbiologie: Grundlagen und Ergebnisse*, Nov., 793
- Gebauer, A. *Das diagnostische Pneumoperitoneum*, Oct., 622

**BOOKS RECEIVED—cont.**

**Gebauer, A., Muntean, E., Stutz, E., and Vieten, H.** Das Röntgensichtbild, Oct., 622

**Hanngren, Åke.** Studies on the Distribution and Fate of  $C^{14}$  and T-Labelled *p*-Aminosalicylic Acid (PAS) in the Body. *Acta radiol. suppl.* 175, July, 116

**Hartung, Kurt.** Strahlenbelastung und Strahlenschutz in der pädiatrischen Röntgendiagnostik, Nov., 793

**Heuck, Friedrich.** Die Streifenelektasen der Lunge, Oct., 622

Indemnification of Atomic Energy Activities and Operations of Advisory Committee on Reactor Safeguards, 1958-1959, July, 116

**Jaeger, R. G.** Dosimetrie und Strahlenschutz: Physikalische und technische Daten, Sept., 457

**Kemp, L. A. W., and Oliver, R.** Basic Physics in Radiology, Sept., 456

**Leigh, Ted F., and Weens, H. Stephen.** The Mediastinum, Nov., 792

**Liévre, J.-A., and Fischgold, H.** Radiographie du crâne et de la face dans la maladie osseuse de Paget, Dec., 930

**Martin, Charles L., and Martin, James A.** Low Intensity Radium Intensity, Aug., 276

**Mascherpa, Ferino, and Valentino, Vincenzo.** Intracranial Calcification, Aug., 276

**May, Robert, and Nissl, Raimund.** Die Phlebographie der unteren Extremität, Oct., 622

**Merrill, Vinita.** Atlas of Roentgenographic Positions, Dec., 930

**Mündrich, Karl, and Frey, Kurt-Walter.** Das Röntgensichtbild des Ohres. The Tomogram of the Ear, Sept., 457

1958 Highlights of Progress in Research on Cancer: Items of Interest on Research Studies Conducted and Supported by the National Cancer Institute. Prepared by the National Cancer Institute. Public Health Publication No. 671, Oct., 621

**Odeblad, Erik, Westin, Björn, and Englund, Sven Erik.** Disappearance Measurements: Theoretical, Technical, Biological and Medical Aspects, *Acta radiol. suppl.* 173, July, 116

**Onclay, J. L., Schmitt, F. O., Williams, R. C., Rosenberg, M. D., and Bolt, R. H., editors.** Biophysical Science—A Study Program, Dec., 930

**Owen, Charles A., Jr.** Diagnostic Radioisotopes, Nov., 792

**Paul, Lester W., and Juhl, John H.** The Essentials of Roentgen Interpretation, July, 115

**Porcher, Pierre, Stössel, Hans-Ulrich, and Mainguet, Paul.** Klinische Radiologie des Magens und des Zwölffingerdarms, Nov., 793

**Portmann, Michel, and Guillen, Georges.** Radiodiagnostic en otologie, Sept., 457

**Prévot, R., and Lassrich, M. A.** Röntgendiagnostik des Magen-Darmkanals, Sept., 457

**Roy-Camille, Raymond.** Coupes horizontales du tronc: Atlas anatomique et radiologique à l'usage des chirurgiens et des radiologues, Sept., 457

**Schwartz, Laszlo.** Disorders of the Temporomandibular Joint: Diagnosis, Management, Relation to Occlusion of Teeth, Nov., 792

**de Sèze, S., Ryckewaert, A., and Maitre, M.** L'Épaule en pratique rhumatologique, Dec., 930

**Shanks, S., Cochrane, and Kerley, Peter, editors.** A Text-Book of X-Ray Diagnosis by British Authors. Vol. IV. The Bones, Joints, and Soft Tissues, Nov., 792

**Sharpet, Burke, and Plant, Marcus L.** The Law of Medical Practice, Nov., 793

Sonderausschuss Radioaktivität Bundesrepublik Deutschland. Zweiter Bericht, März 1959, Sept., 457

Thyroid Radioiodine Uptake Measurement: A Standard System for Universal Intercalibration, ORINS-19, Sept., 456

**Töndury, G.** Angewandte und topographische Anatomie: Ein Lehrbuch für Studierende und Ärzte, July, 116

**Trifaud, André, and Bureau, Henri.** Tumeurs bénignes des os et dystrophies pseudotumorales, Aug., 277

**Wachsmann, F., and Barth, G.** Die Bewegungsbestrahlung, Sept., 457

**Walter, J., and Miller, H.** A Short Textbook of Radiotherapy for Technicians and Students, Aug., 276

**Wansker, Bernard A.** X-ray and Radium in Dermatology, July, 115

**Whitfield, I. C.** An Introduction to Electronics for Physiological Workers, July, 116

**Whyte, G. N.** Principles of Radiation Dosimetry, Aug., 276

**Bothe, C. C., Evans, K. T., Menzies, T., and Street, D. F.** Intestinal hypertrophy following partial resection of the small bowel in the rat (ab), Nov., 812

**Borden, Anthony Borealis.** See *Forman, Myron*

**Borman, Chauncey N.** Broncho-pulmonary segmental anatomy and bronchography (ab), Oct., 640

**Boron, RADIOACTIVE.** See *Radioactivity, radioboron*

**Borthwick, R. A.** See *Gunz, F. W.*

**Boswell, W. L.** Roentgen aspects of blastomycosis (ab), Dec., 955

**Rotseas, D. S., and Lawrence, G. H.** Skin necrosis complicating femoral arteriography (ab), Nov., 809

**Boudreau, Robert P., and Crosby, R. M. N.** The significance of subdural air in pneumoencephalograms in infants (ab), July, 127

**Bouvry, M.** See *Debray, Ch.*

**Boyd, J. F., Park, S. D. Scott, and Smith, George.** Correlation between various assessments of pulmonary arterial pressure in mitral stenosis (ab), Aug., 297

**Boyer, Randal A.** See *Lehman, J. Stauffer*

—See *Lehman, William M.*

**Brack, C., Bernard, Nesbitt, Robert E. L., Jr., and Everett, Houston S.** Neoplasms of the female urinary bladder (ab), Nov., 826

**Braddock, G. T. F.** Experimental epiphysial injury and Freiberg's disease (ab), Dec., 952

**Bradford, W. B.** See *Woltz, John H. E.*

**Bradford, W. Z.** See *Woltz, John H. E.*

**Bradshaw, A. L.** See *Dolphin, G. W.*

**Braestrup, Carl B.** Physical and clinical advantages and limitations of cobalt 60 teletherapy. Part I. Physical factors (ab), Nov., 831

**Brailey, Allen G., Jr., and Husebye, Kjeld O.** Varicella pneumonia with prolonged roentgenologic change (ab), Aug., 291

**Brain**  
See also Cerebellum; Meninges; Pineal Body; Pituitary Body  
—neurological syndromes associated with congenital absence of odontoid process (ab), L. P. Rowland et al, July, 129  
—time-dose relationship and morphology of delayed radiation lesions of brain in rabbits (ab), Niels O. Berg and Martin Lindgren, Sept., 499  
—tolerance of brain tissue and sensitivity of brain tumors to irradiation (ab), Martin Lindgren, July, 154

**abnormalities**  
—local bulging of skull and external hydrocephalus due to cerebral agenesis (ab), R. G. Robinson, Oct., 638

**abscess**  
—radiological investigation of intracranial abscess (ab), G. Kenneth Tutton and Robert Ollerenshaw, Aug., 286

**blood supply.** See also Brain tumors; Thrombosis  
—angiographic experiences in basilar skull projection (ab), L. Ghirardi et al, Oct., 638

—avoidance of false angiographic localization of site of internal carotid occlusion (ab), Francis Murphey and John Shillito, Jr., Nov., 800

—blood pressure changes in cerebral arteries during carotid angiography with Umbradil (ab), Ulf Söderberg and Nils Weckman, July, 128

—cerebral angiographic contrast media: a comparison of Hypaque 45% and Urographin 60% and an assessment of the relative clinical toxicity of Urographin 60%, Hypaque 45%, Diagnol 25% and Diiodone 35% in carotid arteriography (ab), A. T. Broadbridge and E. V. Leslie, Aug., 286

—cerebral angiography: clinical experience with comparative contrast media (ab), Ralph A. Munslow et al, Sept., 463

—cerebral angiography: new technic. Catheterization of common carotid artery via superficial temporal artery (ab), Israel H. Weiner et al, Sept., 463

—cerebral arteriography—diagnostic value in cerebrovascular disease (ab), Basdeo Balkissoon et al, Dec., 937

—intracranial extension of tumors of ethmoid, orbit, and rhinopharynx: angiographic study (ab), G. J. Melot et al, July, 129

—observations on hemiplegia with middle cerebral artery trunk occlusions and with "normal" carotid angiograms (ab), J. E. Webster and E. S. Gurdjian, July, 128

—practical value of internal cerebral vein in anteroposterior phlebogram (ab), Frederick Murtagh and Herbert M. Stauffer, Oct., 639

—sign of early regional venous opacification in rapid carotid serial angiography (ab), E. Woringer et al, July, 136

—subarachnoid hemorrhage: prognosis when angiography reveals no aneurysm. Report of 138 cases (ab), Olle Höök, Sept., 463

—vertebral arteriography in neurosurgical diagnosis (ab), G. Ruggiero et al, Aug., 286

**calcification**  
—symmetric familial cerebral calcification (ab), H. J. Schafroth, Dec., 938

**echinococcosis**  
—combined intraventricular and intracerebral hydatid cysts, case, Vincenzo Valentino, Aug., 250

**roentgenography.** See also other subheads under Brain  
—intracranial pneumoangiography in verticosubmental position: a neuroangiographic refinement (ab), W. Eugene Stern et al, July, 127

—iodoventriculography in lesions of posterior fossa (ab), G. Cornélis et al, Aug., 286

—pneumoencephalography with direct injection and positional directing of air (ab), Mark Dyken, Nov., 799

—relationship between findings in pneumoencephalograms and clinical behavior (ab), Hilda Knobloch et al, Sept., 463

—significance of subdural air in pneumoencephalograms in infants (ab), Robert P. Boudreau and R. M. N. Crosby, July, 127

**tumors**  
—glioblastoma multiforme; review of 219 cases with regard to natural history, pathology, diagnostic methods, and treatment (ab), Saul A. Frankel and William J. German, July, 127

**BRAIN, tumors—cont.**

- hemangioma of skull associated with intracranial angioma (ab), Laba Scheinberg and Milton Elkin, July, 128
- our experiences with the diagnostic utilization of the deep phlebogram in intracranial space-occupying lesions (ab), S. Nett et al., Nov., 799
- positron-scanning with copper-64 in diagnosis of intracranial lesions: partition of copper-64 versenate in, and excretion from, the body (ab), H. J. Bagnall et al., Sept., 488
- postoperative dissemination of astrocytoma of spinal cord along ventricles of brain; case (ab), D. M. Perese et al., Nov., 818
- sella, brain and disease: value of radiographic study of sella turcica in morbid anatomical and topographic diagnosis of intracranial tumors (ab), Mahmoud El Sayed Mahmoud, Sept., 464
- tolerance of brain tissue and sensitivity of brain tumors to irradiation (ab), Martin Lindgren, July, 154

**BRANZ, CARLO.** See LENZI, MARIO

**BRANTSCHEN, G.** Osteomyelitis of the femoral neck (ab), Oct., 658

**BRASCHE, H.**: A contribution to the technic of aortography (ab), July, 133

**BRAUER, RALPH W.** See KREBS, JOHN S.

**BRAUN, J. P.** See WORINGER, E.

**BREAM, CHARLES A.** See WOOD, ERNEST H.

**BREAST**

- aplasia of a breast after deep roentgen therapy for a mediastinal sarcoma (ab), Ch. M. Gross and R. Keeling, Aug., 325
- Cancer**
- breast cancer in Connecticut, 1935-1953; study of 8,396 proved cases (ab), Allan J. Ryan et al., Aug., 317
- cancer of breast: study of short survival in early cases and of long survival in advanced cases (ab), D. W. Smithers, Sept., 485
- carcinoma of breast in Middletown, U.S.A. (ab), Thomas C. Moore et al., Aug., 317
- dose distribution with four radiation techniques for carcinoma, Mary Louise Meurk and Florence C. H. Chu, Oct., 607
- hypophysectomy combined with intrasellar irradiation with yttrium 90 (in advanced mammary carcinoma); preliminary communication (ab), G. A. Edelstyn et al., Aug., 322
- report of 549 cases of breast cancer in women 35 years of age or younger (ab), Norman Treves and Arthur I. Holleb, July, 149
- roentgenography and biopsy in mammary cancer, Simon M. Berger, Helen Ingleby and J. Gershon-Cohen, Dec., 891
- screw-implantation of pituitary with yttrium 90 (in metastatic mammary cancer) (ab), A. P. M. Forrest et al., Aug., 321
- simple mastectomy and postoperative irradiation for carcinoma of breast. Report from the Saint John General Hospital (ab), J. A. Caskey, Dec., 956
- tolerance of skin grafts to radiation: a study of post-mastectomy irradiated grafts (ab), R. W. Cram et al., Nov., 836
- diseases**
- diagnosis of diseases of mammary gland (ab), E. D. Shibaeva, Sept., 488
- roentgenography.** See also Breast, cancer
- roentgen examination of breast (ab), K. Werner et al., July, 137

**BRENNAN, JAMES C.** See TENG, CHING TSENG

**BREWER, LYMAN A., III, BAI, ANGEL F., LITTLE, JOHN N., and RABAGO Y PARDO, GREGORIO:** Carcinoma of the lung. Practical classification for early diagnosis and surgical treatment (ab), Aug., 288

**BRIHAYE, J.** See MELOT, G. J.

**BROADBRIDGE, A. T., and LESLIE, E. V.:** Cerebral angiographic contrast media: a comparison of Hypaque 45% and Urograffin 60% and an assessment of the relative clinical toxicity of Urograffin 60%, Hypaque 45%, Diagnol 25% and Diiodone 35% in carotid arteriography (ab), Aug., 286

**BRODEN, BROR, and KARNELL, JOHAN:** Coarctation of the aorta: aortographic studies before and after operation (ab), Aug., 294

**BRODERS, A. COMPTON, Jr.** See HIGHTOWER, NICHOLAS G. Jr.

**BROGDON, BYRON G., and CROW, NEIL E.:** Chondro-dystrophy calcificans congenita (ab), July, 141

—See CROW, NEIL E.

**BRONCHI**

- See also Bronchiectasis
- accessory lung communicating with bronchial tree (ab), W. Lüdke and M. Pöschl, Dec., 939
- anomalous artery in intralobar bronchopulmonary sequestration; 2 cases demonstrated by angiography (ab), Franklyn P. Gerard and Harold A. Lyons, Aug., 299
- bronchopulmonary complications revealing an unrecognized megaesophagus (ab), J. Le Melletier et al., Nov., 803
- amebiasis. See Amebiasis
- cancer. See Lungs, cancer
- funga. See Fistula

**obstruction**

- endoscopic aspects of primary tuberculosis in children (ab), John F. Daly, Oct., 641
- roentgenography**
- art and science of bronchography in infants and children (ab), Duane L. Merrill and Paul C. Samson, Oct., 640
- bronchopulmonary segmental anatomy and bronchography (ab), Chauncey N. Borman, Oct., 640
- problem of absorption of liquids from lung, particularly bronchographic contrast material (ab), M. Roth, Dec., 942
- tumors**
- tracheobronchial papillomatosis treated by roentgen irradiation; 2 cases, James Blackman, Simeon T. Cantrell, Paul K. Lund and Donald Sprakman, Oct., 598

**BRONCHIECTASIS**

- congenital absence of main branch of pulmonary artery; report of 3 new cases associated respectively with bronchiectasis, atrial septal defect and Eisenmenger's complex (ab), Israel Steinberg, Aug., 293

**BRONCHOGRAPHY.** See Bronch, roentgenography

**BROWN, CHARLES H.** See DAFFNER, JOHN E.

**BROWN, GEORGE.** See GOLDRING, DAVID

**BROWN, TRAVIS.** See LEIB, GILBERT M. P.

**BROWNELL, G. L.** See BAGNALL, H. J.

**BROWNING, R. H.** See CHRISTOFORIDIS, A. J.

**BROWNING, WILLIAM H., REED, D. CRAMER, and O'DONNELL, HAROLD:** Delayed cystography: a valuable diagnostic tool (ab), Nov., 820

**BRUCELLOSIS**

- brucellosis and echinococcosis in Argentina; a short clinical and radiological report (ab), H. H. Weber, Aug., 315
- undulant fever spondylitis (ab), F. Zammit, Oct., 656

**BRUNNER, S.** Bronchogenic carcinoma arising in a lung cyst. Report of a case (ab), Dec., 940

**BRUNNER, A.:** The so-called aspergilloma (ab), Aug., 29

**BRUNNER'S GLANDS.** See Duodenum

**BRUWER, ANDRE J., and ELLIS, F. HENRY, Jr.:** A slow injection method of aorto-arteriography (ab), July, 135

**BUCKY, N. L.:** Bone infarction (ab), Nov., 815

—See DAVIES, PAGET

**BUGNION, M.** See CANDARDJIS, G.

—See KRIEG, P.

**BULL, J. W. D.** See PERRETT, L. V.

**BULLEN, M. A., and INCH, W. R.:** Rotation therapy with a cobalt-60 unit. III. Integration of the transmitted beam as a means of estimating tumour dose (ab), Aug., 322

**BUNNER, ROLAND:** Lateral intrathoracic meningoele (ab), Nov., 819

**BURAN, ROBERT.** See RUBIN, PHILIP

**BURKE, D. G.** See CORMACK, D. V.

**BURKLE, JOSEPH S., and GLIEDMAN, MARVIN L.:** External recording method for estimating hepatic blood flow with the use of radiogold (ab), Nov., 831

**BURMAN, MICHAEL:** Anteroposterior projection of the carpometacarpal joint of the thumb by radial shift of the carpal tunnel view (ab), Aug., 310

Osteotomy of the spine; formation of a wedge vertebra in the hyperextension gap, July, 104

**BURNETT, W., and SHIELDS, R.:** Movements of the common bileduct in man. Studies with the image intensifier (ab), Sept., 475

**BURNS**

- burn following accidental exposure to high-energy radiation (ab), Lester M. Cramer et al., Dec., 963
- periarticular soft-tissue changes as a late consequence of burns (ab), Jaromir Kolar and Radko Vrabel, Nov., 815

**BURNSIDE, ALFRED F., Jr.** See BERNATZ, PHILIP E.

**BUSCHKE, FRANZ, and GALANTE, MAURICE:** Radical preoperative roentgen therapy in primarily inoperable advanced cancers of the head and neck, Dec., 845

**BUSHUEFF, BORIS.** See WARTHIN, THOMAS A.

**BUETTNER, D.** See WERNER, K.

**BUTLER, PATRICK F.** (obit), Sept., 459

**C**

**CAFFEY, JOHN:** Achondroplasia of pelvis and lumbosacral spine; some roentgenographic features (ab), July, 144

—and ROSS, STEVEN: Pelvic bones in infantile mongolism; roentgenographic features (ab), July, 144

**CAHAN, WILLIAM G.** See SHERMAN, ROBERT S.

**CAINE, MARCO, and EDWARDS, DAVID:** The peripheral control of micturition: A cineradiographic study (ab), Oct., 600

**CAIRNS, D. R.** See EARN, ALBERT A.

**CALCANEUS**

- nonunion of fracture of anterior superior process of calcaneus; case (ab), Jack Levine et al., Nov., 818

**CALCIFICATION.** See Gallbladder; Heart; Kidneys; Thyroid; cancer; Trachea; etc.

**CALCUM, RADIOACTIVE.** See Radioactivity, radio-calci-

**CALCULI.** See Gallbladder; Kidneys; Lungs; etc.

**CALLAHAN, DANIEL H.** See BAKER, WILLIAM J.

**CAMINHA, NICOLA C.** See LANDMAN, JAYME

**CAMPBELL, JOHN A.** See **KLATTE, EUGENE C.**

**CAMPETI, FRANK L., GRAMIAK, RAYMOND, WATSON, JAMES S., JR., and RAMSEY, GEORGE H.**: Functional diagnosis of patent ductus arteriosus studied by cineangiography in fifty-three cases (ab), Sept., 468

**—RAMSEY, GEORGE H., GRAMIAK, RAYMOND, and WATSON, JAMES S., JR.**: Dynamics of the orifices of the venae cavae studied by cineangiography (ab), Nov., 806

**CANADA**: gonadal dose in Canada arising from clinical use of unsealed radioactive isotopes (ab), H. E. Johns and R. M. Taylor, Oct., 667

**CANCER**: See also Sarcoma; under organs and regions  
—radioactivity and human skeleton (ab), L. D. Marinelli, Sept., 494

**Ehrlich carcinoma.** See Tumors, experimental metastases. See also Bones, cancer; Lymph Nodes, cancer  
—screw-implantation of pituitary with yttrium 90 (in metastatic mammary cancer) (ab), A. P. M. Forrest et al, Aug., 321

—successful radioiodine therapy in 2 cases of metastasizing carcinoma of thyroid (ab), J. H. Müller, Oct., 665

—venographic and scintillographic demonstration of liver metastases (ab), C. G. Helander et al, Oct., 652

—vertebral pedicle sign: a roentgen finding to differentiate metastatic carcinoma from multiple myeloma (ab), Harold G. Jacobson, Sept., 477

**radiotherapy**:  
—attempts at modification of radiation response of neoplasms by administration of hematoporphyrin (ab), Robert Bases et al, Oct., 668

—clinical evaluation of radioactive chrome phosphate in control of malignant pleural and ascitic effusions, Charles R. Perryman, Edward J. Pavsek and John D. McAllister, Dec., 865

—clinical experience with high-speed electrons in cancer therapy, Erich M. Uhlmann, July, 76

—effect of combined irradiation and chemotherapy on cancer growth, with special reference to studies with folic acid analogues, Merle K. Loken, Young S. Kim, Donn G. Mosser and James F. Marvin, Aug., 166

—irradiation of tumors with gold seeds: simplification of calculation (ab), A. Bercy, Sept., 491

—palladium 103: a new isotope for interstitial implantation at operation (ab), Paul V. Harper et al, Aug., 322

—rotation therapy with cobalt-60 unit. III. Integration of transmitted beam as means of estimating tumor dose (ab), M. A. Bullen and W. R. Inch, Aug., 322

—theoretical study of dosage and geometric distribution of radioactive gold seeds in interstitial radiotherapy (ab), A. Bercy and A. Delferrière, Sept., 491

—various practical methods of grid therapy (ab), Gerhart Baum, Sept., 487

**tuberculosis and cancer**:  
—pulmonary tuberculosis associated with carcinoma of lung (ab), A. J. Christoforidis and R. H. Browning, Dec., 940

**CANDARDIS, G., and BUGNION, M.**: Current indications for roentgen pneumography (ab), Nov., 822

**CANTLIN, M. L., ROMINGER, C. JULES, and OSULLIVAN, WARD D.**: Surgical treatment of some pulmonary conditions in childhood (ab), Oct., 643

**CANTRIL, SIMEON T.** See **BLACKMAN, JAMES**

**CAPILLARIES.** See **Telangiectasia**

**CARABASI, ROBERT J.**: Diffuse interstitial pulmonary fibrosis (Hamman-Rich syndrome). Report of three cases (ab), Sept., 466

**CARBON**:  
—treatment of lung tumors with radioactive gold-carbon suspension; animal experiments (ab), Helmut Ernst et al, Sept., 490

**radioactive.** See **Radioactivity, radiocarbon**

**CARBON DIOXIDE**:  
—diagnosis of pericardial effusion with intracardiac carbon dioxide, James H. Scatiff, Alfred J. Kummer and Arnold H. Janzen, Dec., 871

—use of intravascular carbon dioxide gas to demonstrate interstitial septal defects (ab), William Winters et al, Nov., 804

**CARDIA.** See **Stomach**

**CARDIOVASCULAR SYSTEM**:  
See also Aneurysm; Aorta; Heart; etc.  
—some clinical aspects of isotope circulation studies, Richard H. Greenspan, Richard G. Lester, James F. Marvin and Kurt Amplatz, Sept., 345

**abnormalities**:  
—situs inversus totalis associated with complex cardiovascular anomalies (ab), Karl J. Schmutz and Leonard M. Linde, Sept., 468

**roentgenography.** See also Heart, abnormalities  
—angiographic features of Bland-White-Garland syndrome (ab), Erich K. Lang et al, Nov., 807

—angiographic observations in mitral disease with special reference to volume variations in left atrium (ab), Håkan Arvidsson, Aug., 296

—angiography as an aid to identification of nonresectable pulmonary carcinomas (ab), Stanley M. Wyman and Earle W. Wilkins, Jr., Oct., 640

—anomalous artery in intralobar bronchopulmonary sequestration; 2 cases demonstrated by angiography (ab), Franklyn P. Gerard and Harold A. Lyons, Aug., 299

—approach to biplane cineangiography. 3. Early clinical observations, Herbert L. Abrams, Oct., 531

—arteriography and cardioangiography (ab), S. B. Feinberg, July, 136

—dynamics of orifices of venae cavae studied by cineangiography (ab), Frank L. Campeti et al, Nov., 806

—functional diagnosis of patent ductus arteriosus studied by cineangiography in 53 cases (ab), Frank L. Campeti et al, Sept., 468

—intravenous angiographies; analysis of 660 cases (ab), A. Castellanos et al, July, 136

—opacification of atelectatic lung segment during selective angiography, Harold G. Jacobson, Berta M. Rubinstein and Doris J. W. Escher, July, 95

—perforation of heart during cardiac catheterization and selective angiography (ab), Doris J. W. Escher et al, July, 137

—reaction of heart to selective angiography (ab), Russell A. McFall et al, Nov., 803

—role of angiography in surgical treatment of massive pericardial effusions (ab), Cranston W. Holman and Israel Steinberg, Sept., 469

—selective cineangiography with image intensification (ab), Hamish Watson et al, Aug., 299

—technical factors in selective cinecardioangiography, Eugene C. Klatte, John A. Campbell and Paul R. Lurie, Oct., 539

—ultra-short (millisecond) timing in roentgen diagnostic procedures including angiography: comparison of dynapulse and impulse timing (ab), Barton R. Young et al, Nov., 804

**CARMICHAEL, DAVID B.** See **KUZMAN, WILLIAM J.**

**CARNEVALLI, G., and DI PIETRO, S.**: Radiologic possibilities in the diagnosis of lumbar aortic lymph node enlargement by means of retroperitoneal air insufflation (ab), Oct., 661

**CARON, J.** See **BONTE, G.**

**CAROTHERS, E. L.** See **HAHN, P. F.**

**CARPAL TUNNEL.** See **Wrist**

**CARPENDER, JAMES W. J.** See **IRONSIDE, WILLIAM M. S.**

**CARPENTER, HARRY M.** See **WILLIAMS, R. BLAND, JR.**

**CARPOMETACARPAL JOINT.** See **Wrist**

**CARR, EDWARD A.** See **LOWREY, GEORGE H.**

**CARRASCO-AZEMAR, J.** See **TORNER-SOLER, M.**

**CARTER, ANNE C., WEISENFELD, SHIRLEY, and WALKACE, ELEANOR Z.**: Effect of oral Lipiodol on thyroidal <sup>131</sup>I uptake and serum protein-bound iodine concentration (ab), Dec., 960

**CARTILAGE**:  
costal. See Ribs  
thyroid. See Larynx

**CASKEY, J. A.**: Simple mastectomy and postoperative irradiation for carcinoma of the breast. A report from the Saint John General Hospital (ab), Dec., 956

**CASSEL, CHESTER, and UNGER, HAROLD M.**: Primary carcinoma of the jejunum (ab), July, 139

**CASTELLANOS, A., GARCIA, O., and GONZALEZ, E.**: Intravenous angiographies. An analysis of 660 cases (ab), July, 136

**CASTS**:  
—plaster casts for radiation therapy of oral carcinoma, Marion F. Magalotti, July, 100

—pulmonary arteriovenous fistula associated with capillary telangiectasia (Rendu-Osler-Weber disease); case illustrating use of metal casting for demonstrating lesion (ab), Israel Steinberg et al, Oct., 647

**CATHARTICS**:  
—colon preparation for radiological studies using a new drug (Dulcolax) (ab), John A. Martin, Nov., 813

—experiences with a new contact laxative (Dulcolax) in preparation of colon for radiological examination (ab), Richard K. Keogh and Robert G. Fraser, Oct., 650

**CATHETERS AND CATHETERIZATION.** See **Arteries, brachial; Arteries, carotid; Heart, catheterization; Veins, renal; etc.**

**CATHODE**:  
—roentgen tube with bifocal rotating cathode for production of convergent beams (ab), Mario Lenzi et al, Aug., 320

**CAUDA EQUINA**:  
—radiopacity of glass foreign bodies, with report of case of injury of cauda equina by fragments of glass (ab), W. Bryan Jennett and James A. Watson, Sept., 478

**CAULET, T. R.** See **LE MELLETIER, J.**

**CAVINAS, CESARE, and VICHI, GIANFRANCO**: Radiologic aspects of pleural effusions in the nephrotic syndrome and glomerulonephritis in childhood (ab), Oct., 643

**CELLS**:  
See also **Tissue**  
—biological effect of cellular structures in normal and irradiated rabbits (ab), N. N. Klemparskaya et al, Nov., 838

—cell renewal and acute radiation damage, Henry Quastler, Aug., 161

**CELLS—cont.**

- effect of total-body x-radiation from near-threshold to tissue-lethal doses on small-bowel epithelium of rat. I. Changes in morphology and rate of cell division in relation to time and dose (ab), R. Bland Williams et al, July, 156
- effect of total-body x-radiation from near-threshold to tissue-lethal doses on small-bowel epithelium of rat. II. Changes in nucleic acid and protein synthesis in relation to cell division (ab), Jane N. Toal et al, July, 157

**CEREBELLUM**

- posterior fossa arteriovenous aneurysm with occlusion of a vertebral artery (ab), Robert A. Teasdall, July, 129

**CEREBRUM. See Brain****CESAREAN SECTION**

- hysterographic study of uterus after cesarean section (ab), L. O. S. Poidevin and V. Y. Bockner, Aug., 311

**CESIUM, RADIOACTIVE. See Radioactivity, radioisotopes****CHACE, JOHN F., and COFFAY, E. P., Jr.: Role of photofluorography in Navy tuberculosis control (ab), Nov., 801****ROCKOFF, S. DAVID, and HELLMAN, LOUIS P.: Pulmonary infiltration and fibrosis of unknown etiology. The risk of developing active pulmonary tuberculosis (ab), Dec., 941****CHAMLIN, MAX: Visual field changes produced by x-ray treatment of pituitary tumors (ab), Aug., 324****CHANG, C. H. (JOSEPH), and ROGERS, JAMES V., Jr.: Cor triatriatum minimorum (ab), Nov., 805****CHAPMAN, CARLETON B., BAKER, ORLAND, REYNOLDS, JACK, and BONTE, FREDERICK J.: Use of biplane cineruorography for measurement of ventricular volume (ab), Oct., 645****CHARCOT JOINTS. See Ankle****CHAU, PAUL M. See SINGLETON, EDWARD B.****CHAVEZ, MARCELINO. See SMITH, GEORGE W.****CHEMICALS AND CHEMOTHERAPY**

See also Folic Acid Antagonists

- effect of chemical protection (2-mercaptoethylguanidine-HBr) and bone marrow treatment on radiation injury in mice (ab), Paul Ursu et al, July, 159
- effects of chemotherapy and irradiation therapy on differentiation of experimental tumors (ab), Nathan B. Friedman and Eileen Drutz, Oct., 668

**CHEST. See Thorax****CHICKENPOX**

- varicella pneumonia with prolonged roentgenologic change (ab), Allen G. Brailey, Jr., and Kjeld O. Husebye, Aug., 291

**CHILDREN**

See also Bones, growth; Heart, abnormalities; Infants, Newborn; Intussusception

- acute leukemia in infant following excessive intrauterine irradiation (ab), F. W. Gunz et al, Sept., 495
- acute obstruction of small intestine secondary to hematoma in children (ab), A. L. Mestel et al, Nov., 812
- acute radiation nephritis in childhood (ab), J. Swanson Beck, Aug., 326
- aortic stenosis in infants and children (ab), Patrick A. Ongley et al, July, 132
- art and science of bronchography in infants and children (ab), Duane L. Merrill and Paul C. Samson, Oct., 640
- calcification of hyoid, thyroid and tracheal cartilages in infancy; case (ab), P. E. Russo and C. G. Coin, July, 130
- classification of urographic patterns in children with congenital bladder neck obstruction (ab), Aurelio C. Usón et al, Sept., 482
- coproliths (calcified appendiceal calculi) in children (ab), Frank C. Stiles, Oct., 651
- duodenal ulcers in children, with notes on their etiology, John O. Lafferty, Sept., 374
- effects of kwashiorkor on development of bones of knee (ab), P. R. M. Jones and R. F. A. Dean, Dec., 952
- endoscopic aspects of primary tuberculosis in children (ab), John F. Daly, Oct., 641
- hip arthrography in children, with Renografin, James C. Barnett and Joseph P. Arcamone, Aug., 245
- lymphosarcoma in childhood (ab), Saul A. Rosenberg et al, Aug., 320
- lymphosarcoma of small intestine in infancy and childhood (ab), A. L. Mestel, Nov., 812
- malrotation of midgut in infancy and childhood (ab), William B. Kiesewetter and John W. Smith, Aug., 305
- occurrence and significance of vesico-ureteral reflux in children (ab), W. I. Forsythe and R. F. Whelan, Oct., 660
- occurrence of thyroid nodules in children following therapy with radioiodine for hyperthyroidism (ab), Glenn E. Sheline et al, Nov., 830
- pelvic bones in infantile mongolism: roentgenographic features (ab), John Caffey and Steven Ross, July, 144
- postpneumonic pseudo air cysts in children (ab), K. Schlaeger, Aug., 291
- primary fibrosarcoma of lung in young child; case treated by lobectomy and cobalt therapy (ab), F. S. Gerbasi et al, Dec., 957
- prognosis in neuroblastoma of childhood (ab), Wataru W. Sutow, July, 151

—radiation therapy of solitary benign cystic-appearing lesions involving long bones of children (ab), James C. Cook et al, July, 151

—radiologic aspects of pleural effusions in nephrotic syndrome and glomerulonephritis in childhood (ab), Cesare Cavina and Gianfranco Vichi, Oct., 643

—radiologic study of physiologic knock-knee in childhood (ab), D. W. MacEwan and J. S. Dunbar, Oct., 658

—radiological observations on 33 cases of primary interstitial myocarditis during an outbreak in Haifa area (ab), J. Munk and K. T. Lederer, Aug., 297

—reducing gonad irradiation in pediatric diagnosis (ab), Harry A. Bishop et al, Dec., 964

—right heart catheterization in infants and children: analysis of data obtained in study of 218 patients (ab), Burton W. Fink et al, Oct., 644

—should intravenous pyelography be a routine procedure for children with cryptorchism or hypospadias? (ab), Lester M. Felton, Dec., 954

—sialography in children (ab), Bromley S. Freeman, Aug., 287

—significance of subdural air in pneumoencephalograms in infants (ab), Robert P. Boudreau and R. M. N. Crosby, July, 127

—simple device for obtaining lateral acetabular views of hip in infants, Donald B. Darling, Sept., 432

—solitary unicameral bone cyst in 7-week-old infant (ab), M. E. Tauseef and Milton Marcus, Nov., 815

—study of fat absorption utilizing  $^{113}\text{I}$ -labeled corn oil in infants and children with and without steatorrhea (ab), Samuel Spector et al, Oct., 663

—surgical treatment of some pulmonary conditions in childhood (ab), M. L. Cantlin et al, Oct., 643

—torsion of stomach as cause of vomiting in infancy (ab), S. Eek and H. Hagelsteen, Aug., 301

—traumatic dislocation of radial head as isolated lesion in children; report of 1 case with special regard to roentgen diagnosis (ab), Gunnar Støren, Nov., 818

—treatment of hemangioma of infants and young children (ab), Robert J. Reeves, Nov., 823

**CHOLANGIOGRAPHY. See Bile Ducts****CHOLECYSTITIS. See Gallbladder****CHOLECYSTOGRAPHY. See Gallbladder, roentgenography****CHOLECYSTOKININ**

—cholecystocholangiography with cholecystokinin (ab), A. J. Ch. Haex and D. Limburg, Aug., 308

—emptying of human gallbladder under stimulus of cholecystokinin (ab), Paul Edholm, Oct., 653

**CHOLODOCHUS. See Bile Ducts****CHONDRODYSPLASIA CALCIFICANS CONGENITA. See Achondroplasia****CHONDROMA. See Tumors, chondroma****CHRISTOFORIDIS, A. J., and BROWNING, R. H.: Pulmonary tuberculosis associated with carcinoma of the lung (ab), 940****CHROMIUM, RADIOACTIVE. See Radioactivity, radiochromium****CHU, FLORENCE C. H. See MEURK, MARY LOUISE****CHUNGCHAROEN, DITHI. See WINTERS, WILLIAM****CIARPAGLINI, L., and IANNACCONE, G.: Dynamic changes of the varicose esophagus. A cineradiographic study with the image intensifier (ab), Dec., 946****CIMMINO, CHRISTIAN V.: The fatty meal in oral cholecystography. A reevaluation, with comments on "tumors" of the gallbladder, and on its Rokitansky-Aschoff sinuses (ab), Dec., 949****CINEANGIOCARDIOGRAPHY. See Cineuroentgenography****CINEFLUOROGRAPHY. See Cineuroentgenography****CINEMATOGRAPHY. See Cineuroentgenography****CINEEROENTGENOGRAPHY**

—approach to biplane cineangiocardiography. 3. Early clinical observations, Herbert L. Abrams, Oct., 531

—cinefluorographic study of pharyngeal function related to speech, John A. Kirkpatrick and Richard W. Olmsted, Oct., 557

—cinefluorography employing split-image television type image amplifiers, Paul C. Hodges and Robert D. Mosley, Jr., Oct., 548

—cinefluorography in practice, Earl R. Miller, Oct., 560

—current indications for roentgen cinematography (ab), G. Candardjis and M. Bugnion, Nov., 822

—current technical problems in cinefluorography, Lee B. Lusted, Oct., 527

—dynamic changes of varicose esophagus: cineradiographic study with image intensifier (ab), L. Ciarpaglini and G. Iannaccone, Dec., 946

—dynamics of orifices of venae cavae studied by cineangiography (ab), Frank L. Campeti et al, Nov., 806

—functional diagnosis of patent ductus arteriosus studied by cineangiocardiography in 53 cases (ab), Frank L. Campeti et al, Sept., 468

—peripheral control of micturition: cineradiographic study (ab), Margo Caine and David Edwards, Oct., 669

—selective cineangiocardiography with image intensification (ab), Hamish Watson et al, Aug., 299

—simultaneous fluorocinematography and intraluminal pressure measurements in study of esophageal motility (ab), Gaston Vantrappen et al, Nov., 810

—some uses of cinefluorography in urologic diagnostic problems, William N. Hanafee and Roderick D. Turner, Nov., 733

**CINEROENTGENOGRAPHY**—*cont.*  
 —technical factors in selective cinecardioangiography, Eugene C. Klatte, John A. Campbell and Paul R. Lurie, Oct., 539  
 —University of Rochester, Second Cinefluorographic Symposium, Aug., 275  
 —use of biplane cinefluorography for measurement of ventricular volume (ab), Carleton B. Chapman et al., Oct., 645  
 —use of x-ray cinematography in urological studies (ab), John A. Benjamin, Nov., 820  
 —value of cinematography in diagnosis of malignant strictures of esophagus (ab), F. R. Berridge and D. McC. Gregg, July, 137

**CIRCULATION.** See Arteries, communicating; Blood, circulation; Embolism; Femur, blood supply; Lungs, blood supply; etc.

**CIRCLA, AUGUSTO.** See Galdini, Salvatore

**CLAGETT, O. THERON.** See BERNATZ, PHILIP E.

**CLANCY, ROBERT.** See GORE, IRA

**CLARK, C. G.** Unilateral renal injury due to translumbar aortography (ab), Aug., 298

**CLARK, J. W.** See RAMBACH, W. A.

**CLARK, SAMUEL D.** Where are the cases of radium poisoning? A plea for assistance (ab), Sept., 495

**CLARKE, K. H., FAIRLEY, KEITH D., KING, W. E., and MILNE, JEAN.** Radioiodine tracer tests in the diagnosis of hyperthyroidism (ab), Nov., 828

**CLARKE, ROBERT.** See CORNELL, CARLETON M.

**CLEFT PALATE.** See Palate

**CLEMEDSON, C. J.** See HELDE, M.

**CLINE, JEAN.** See SPECTOR, SAMUEL

**COATES, E. O.** See GISH, JAMES R.

**COCKSHOTT, W. P.** Haemoglobin SC disease (ab), Aug., 309

**CODINGTON, JOHN B., and COWLEY, R. ADAMS.** Complete intrathoracic goiter simulating an aneurysm of the ascending aorta. Report of a case (ab), Aug., 292

**COFFAY, P. F., JR.** See CHACE, JOHN F.

**COGAN, DAVID G.** Ocular effects of radiation (ab), Aug., 324

**COGAN, SHELDON R., and RITTER, ISRAEL I.** Radiation nephritis. A clinicopathologic correlation of three surviving cases (ab), Aug., 325

**COHAN, BRUCE E.** Radiography of aqueous humor outflow (ab), Aug., 287

**COHEN, ABRAHAM.** See MELTZER, LAWRENCE E.

**COHEN, GEORGE.** Deduction of chemical composition of urinary calculi by radiological means (ab), Oct., 661

**COHEN, M.** See WILSON, CLIFFORD

**COIN, C. G.** See RUSSO, P. E.

**COIN LESIONS.** See Lungs, diseases; Lungs, surgery

**COLD.** —role of food consumption in mortality response of irradiated rats subjected to prolonged cold exposure (ab), Bernard D. Newsom and Donald J. Kimeldorf, Nov., 838

**COLE, LEONARD J.** See SANTOS, GEORGE W.

**COLE, W. R.** Pulmonary alveolar microlithiasis (ab), Nov., 802

**COLIN, R.** See LEENHARDT, P.

**COLITIS.** —chronic ulcerative colitis. I. Diagnostic considerations (ab), Nicholas C. Hightower, Jr., et al., Aug., 305  
 —segmental colitis, Richard H. Marshak, Bernard S. Wolf and Joan Eliasoph, Nov., 707

**COLLAGEN DISEASES.** —changes in chest roentgenogram in collagen diseases (ab), W. Bessler, Oct., 643  
 —Nishet symposium: collagen disease. Part 1. General aspects (ab), R. B. Lefroy, Oct., 662  
 —Nishet symposium: collagen disease. Part 2. The arthritides (ab), Phyllis B. E. Goatcher, Oct., 662  
 —Nishet symposium: collagen disease. Part 3. The radiological changes (ab), B. F. Vaughan, Oct., 663  
 —pulmonary findings in collagen diseases (ed), William R. Eyer, July, 109  
 —pulmonary manifestations in collagen diseases (ab), Charles M. Nice, Jr., et al., Dec., 941

**COLLET, R.** See DEMANET, J. C.

**COLLINS, JAMES NEWTON** (obit), Aug., 272

**COLON.** See also Colitis; Sigmoid  
 —use of radioactive isotopes in study of colonic absorption (ab), J. K. Isley et al., Dec., 961

**ROENTGENOGRAPHY.** See also Intestines, roentgenography  
 —colon preparation for radiological studies using a new drug (Dulcolax) (ab), John A. Martin, Nov., 813  
 —experiences with a new contact laxative (Dulcolax) in preparation of colon for radiological examination (ab), Richard K. Keogh and Robert G. Fraser, Oct., 650  
 —modern trends in diagnostic roentgenology of colon (ab), Söder Welin, July, 140

**COMPRESSION TEST.** See Arteries, vertebral

**CONDYLAR CANAL.** See Occipital Bone

**CONDON, C. C., MAKINODAN, T., GENGIZIAN, M., SHEKARCHI, I. C., and URSO, I. S.** Lymphatic tissue changes in lethally irradiated mice given spleen cells intravenously (ab), July, 160

—See URSO, PAUL

**CONGER, ALAN D., RANDOLPH, M. L., SHEPPARD, C. W., and LUIPPOLD, HELEN J.** Quantitative relation of RBE in Tradescantia and average LET of gamma-rays, x-rays, and 1.3-, 2.5-, and 14.1-Mev fast neutrons (ab), Oct., 669

**CONNECTIVE TISSUE**  
 —Nishet symposium: collagen disease. Part 1. General aspects (ab), R. B. Lefroy, Oct., 662

**CONTRAST MEDIA**  
 See also Aorta, roentgenography; Barium; Brain, blood supply; Bronchi, roentgenography; Urethra; Urinary Tract; etc.

—apparatus for remote injection in radiodiagnostic procedures (ab), D. J. Tibbs and W. G. Leslie, Aug., 315

**COOK, JAMES C., KRABBENHOFT, KENNETH L., and SONGE, ROBERT.** Radiation therapy of solitary benign cystic-appearing lesions involving the long bones of children (ab), July, 151

**COOKE, LORNA, and HUTTON, CHARLES F.** Postbulbar duodenal ulceration (ab), Aug., 302

**COOLEY, DENTON A.** See SINGLETON, EDWARD B.

**COOMBES, W. N.** Leiomyoma of the duodenum (ab), July, 139

**COOPER, J. A. D.** See RAMBACH, W. A.

**COPPER, RADIOACTIVE.** See Copper, radiocopper

**COPROLITHS.** See Appendix, calculi

**CORBUS, HOWARD F., and NIELSON, HENRY, JR.** A simplified method for the urinary excretion test of absorption of cobalt-60 labelled vitamin B<sub>12</sub> (ab), Oct., 666

**CORIELL, LEWIS L., McALLISTER, ROBERT M., WAGNER, BERNARD M., WILSON, SHELDON R., and DWIGHT, SELENA A.** Growth of primate and nonprimate tissue culture cell lines in x-irradiated and cortisone-treated rats (ab), Oct., 669

**CORMACK, D. V., DAVITT, W. E., BURKE, D. G., and RAWSON, E. G.** Spectral distributions of 280 kVp x rays (ab), Aug., 320  
 —and JOHNS, H. E.: Spectral distribution of scattered radiation from a kilocurie cobalt 60 unit (ab), July, 153

**CORN OIL.** See Fat

**CORNÉLIS, G., HOU-HIO-HI, and GONSETTE, R.** Iodoventriculography in lesions of the posterior fossa (ab), Aug., 286

**CORNELL, CARLETON M., and CLARKE, ROBERT.** Vascular calcification involving the gallbladder (ab), Dec., 948

**CORONARY VESSELS**  
 See also Aneurysm, coronary  
 —angiographic features of the Bland-White-Garland syndrome (ab), Erich K. Lang et al., Nov., 807  
 —anomalous left coronary artery arising from pulmonary artery (ab), William J. Kuzman et al., Nov., 806  
 —applicability of angioplasty procedures in coronary atherosclerosis: an estimate through postmortem injection studies (ab), D. Emerick Szilagyi et al., July, 134  
 —arteriographic studies of coronary arteries in ischemic heart disease (ab), Alan P. Thal et al., Oct., 646  
 —phasic dye injection control system for coronary arteriography in the human (ab), L. Stephen Richards and Alan P. Thal, Oct., 646  
 —studies in coronary arteriography: systolic vs. diastolic appearance of coronary arteries, Ortheinrich Hase, Duncan A. Holaday and Ralph A. Deterling, Jr., Nov., 785  
 —suprasternal transaortic coronary arteriography (ab), William M. Lemmon et al., Nov., 807

**CORRIGAN, K. E., and HAYDEN, H. S.** Thin-crystal scintillation counter, July, 107

**CORSCADEN, JAMES A.** See FRICK, HENRY CLAY, II

**CORTÉS, R.** See FIANDRA, O.

**CORTICOSTEROIDS.** See Adrenocortical Preparations

**CORTISONE.** See Adrenocortical Preparations

**COR TRIATRIATUM SINISTRUM.** See Heart, abnormalities

**COUNTERS AND COUNTING**  
 —determination of cardiopulmonary circulation time by external scintillation counting (ab), Ismael Mena et al., Nov., 833  
 —external recording method for estimating hepatic blood flow with use of radiogold (ab), Joseph S. Burkle and Marvin L. Gliedman, Nov., 831  
 —positron-scanning with copper-64 in diagnosis of intracranial lesions: partition of copper-64 versenate in, and excretion from, the body (ab), H. G. Bagnall et al., Sept., 488  
 —splenectomy in hemolytic anemia: results predicted by body scanning after injection of Cr-51-tagged red cells (ab), Paul R. McCurdy and Charles E. Rath, Aug., 322  
 —thin-crystal scintillation counter, K. E. Corrigan and H. S. Hayden, July, 107

—use of magnetic tape for recording radioactivity, Solomon N. Albert, H. N. Eccleston, Jr., T. Fujita, Charles H. Hunter and Chalam A. Albert, Dec., 923

—venographic and scintigraphic demonstration of liver metastases (ab), C. G. Helander et al., Oct., 652

—visualization of internal organs by accentuation scintillation scanning techniques, William J. MacIntyre, Hymer L. Friedell, Godofredo Gomez Crespo and Abbas M. Rejali, Sept., 329

**COWLEY, R. ADAMS.** See CODINGTON, JOHN B.

**COX, H. T., DOHERTY, J. F., and KERR, D. F.**: Changes in the gallbladder after elective gastric surgery (ab), Aug., 306

**COXA PLANA**. See Femur, blood supply

**CRADDOCK, CHARLES G., Jr.** See PERRY, SEYMOUR

**CRAM, R. W., WEDER, C. H., and WATSON, T. A.**: Tolerance of skin grafts to radiation: a study of post-mastectomy irradiated grafts (ab), Nov., 836

**CRAMER, LESTER M., WAITE, JOHN H., EDDCOMB, JOHN H., POWELL, CLINTON C., TUOHY, JOHN H., VAN SCOTT, EUGENE J., and SMITH, ROBERT R.**: Burn following accidental exposure to high energy radiation (ab), Dec., 963

**CRANIUM**  
See also Occipital Bone  
—Deuel's halo sign (ab), Olov Fr. Holm, Aug., 312  
—local bulging of skull and external hydrocephalus due to cerebral agenesis (ab), R. G. Robinson, Oct., 638  
—skull changes in neurofibromatosis of von Recklinghausen (ab), K. Meinardus, Oct., 638

**abnormalities**  
—observations on congenital anomalies in teeth and skull in 2 groups of mental defectives (ab), Richard Spitzer and R. L. Quilliam, Sept., 465

**ossification**  
—cleidocranial dysostosis; report of 2 cases with special characteristics (ab), Johannes Thoms, Oct., 655

**roentgenography**  
—angiographic experiences in basilar skull projection (ab), L. Ghirardi et al., Oct., 638

**tumors**  
—effect of rotation of skull on measured position of pineal gland (ab), John W. Agnos and D. G. Wollin, July, 129

**CRANMORE, D.** See DAVIS, A. K.

**CRAYER, LLOYD F.** See ROSENBERG, SAUL A.

**CRAWFORD, T.**: Some aspects of subarachnoid haemorrhage-a symposium. II. Intracranial aneurysms-pathological aspects (ab), Dec., 937

**CREEDEN, FRANCIS**. See HAGGART, G. EDMUND

**CREPALDI, GAETANO**. See PERRY, SEYMOUR

**CRETINISM**  
—early diagnostic criteria of congenital hypothyroidism: a comprehensive study of 49 cretins (ab), George H. Lowrey et al., Aug., 288

**CROOK, J. C., HULSE, E. V., MULVEY, J. H., and NEARY, G. J.**: The acute effects of partial-body beta irradiation of mice (ab), July, 156

**CROSBY, R. M. N.** See BOUDREAU, ROBERT P.

**CROSS, F. S., GLOVER, D. M., SIMEONE, F. A., and OLDENBURG, F. A.**: Congenital arteriovenous aneurysms (ab), Aug., 294

**CROSS, L. C.** See ETTER, LEWIS E.

**CROW, NEIL E., and BROGDON, BYRON G.**: Cystic lung lesions from metastatic sarcoma (ab), Dec., 941

Radiology's responsibility to the atherosclerotic (ab), July, 133

—See BROGDON, BYRON G.

**CRUICKSHANK, BRUCE, and MARQUIS, R. M.**: Spontaneous aneurysm of the ductus arteriosus. A review and report of the tenth adult case (ab), Oct., 646

**CRYPTORCHISM**. See Testes, undescended

**CULINER, MORRIS M., ABOUAY, JACOB, and REICH, STANLEY B.**: Cavitary carcinoma of the lung (ab), Oct., 641

**CULP, D. A.** See FLOCKS, R. H.

**CULVER, GORDON J., PEREIRA, RUBENS MARCONDES, and SEIBEL, ROY**: Radiographic features of rectosigmoid endometriosis (ab), Oct., 651

**CUNNINGHAM, J. R. S.** See JOHNS, H. E.

**CURRAN, R. C.** See WILSON, G. M.

**CURTIS, H. J., and GEBHARD, KATHARINE**: The relative biological effectiveness of fast neutrons and x-rays for life shortening in mice (ab), July, 158

**CYSTINE AND CYSTEINE**  
—alteration of beta-radiation lesions of skin by cysteine, nitrite, hypoxia, spleen homogenate, and bone-marrow homogenate (ab), A. K. Davis et al., July, 160

**CYSTITIS**  
—irradiation cystitis (ab), Thomas L. Pool, Aug., 326

**CYSTOGRAPHY**. See Bladder, roentgenography

**CYSTOURETHROGRAPHY**. See Urethra

**CYSTS**  
See also Bile Ducts; Bones; Ligaments, hepatic; Lungs; Uterus; etc.

**extradural**. See Spinal Cord, cysts

**perineural**. See Nerves, roots

**CYTOLGY**  
—radiation reaction in vaginal smear and its prognostic significance: studies on radiologically treated cases of cancer of uterine cervix (ab), Ollie Kjellgren, Aug., 319

**D**

**DACQUISTO, MICHAEL P.**: Acquired radioresistance. A review of the literature and report of a confirmatory experiment (ab), Dec., 965

**DAFFNER, JOHN E., and BROWN, CHARLES H.**: Regional enteritis. I. Clinical aspects and diagnosis in 100 patients (ab), July, 140

**DAHL, OLOV, and VIKTERLÖF, KARL JOHAN**: Dose distributions in arc therapy in the 200 to 250 kv range: systematic measurements in homogeneous phantoms with the beam direction perpendicular to the oscillation axis (ab), Nov., 827

**DALAND, ERNEST M.** See WANG, C. C.

**DALITH, FRITZ**. See MARBERG, KURT

**DALY, JOHN F.**: Endoscopic aspects of primary tuberculosis in children (ab), Oct., 641

**D'ANGIO, GIULIO J., FARBER, SIDNEY, and MADDOCK, CHARLOTTE L.**: Potentiation of x-ray effects by actinomycin D, Aug., 175

**DARGEON, HAROLD W., ADIAO, AMPARO C., and PACK, GEORGE T.**: Hemangioma with thrombocytopenia (ab), Dec., 958

—See ROSENBERG, SAUL A.

**DARLING, DONALD B.**: A simple device for obtaining lateral acetabular views of hip in infants, Sept., 432

**DARY, M.** See METZGER, J.

**DAVIES, PAGET, and BUCKY, N. L.**: Tomography of calcified aortic and mitral valves (ab), Nov., 805

**DAVIS, A. K., CRANMORE, D., and ALPEN, E. L.**: Alteration of beta-radiation lesions of the skin by cysteine, nitrite, hypoxia, spleen homogenate, and bone marrow homogenate (ab), July, 160

—See JACOBSEN, ELLY M.

**DAVIS, GEORGE D.** See KINCAID, OWINGS W.

**DAVIS, LAWRENCE A., and VERNILLION, MARGARET**: The relationship of the cardiac silhouette to altered respiratory dynamics in congenital heart disease in infants, July, 49

**DAVIS, W. N.** See LEIB, GILBERT M. P.

**DAVITT, W. E.** See CORMACK, D. V.

**DAWSON, JOHN**: Giant duodenal ulcer (ab), Oct., 649

**DEAN, R. F. A.** See JONES, P. R. M.

**DEBRAY, CH., BOUVRY, M., and ROCHE, P.**: Carcinoma of the gastric stump after resection for benign peptic ulcer (ab), Sept., 474

**DECKER, HENRY G., SHAPIRO, SEYMOUR W., and PORTER, HOWARD R.**: Epidural tuberculous abscess simulating herniated lumbar intervertebral disk. A case report (ab), Dec., 955

**DEGINDER, W. L., and LOVELL, B. K.**: Accelerated palliative radiation therapy of bronchial carcinoma with 250-ky roentgen rays, Nov., 684

**DELFERIERE, A.** See BERCY, A.

**DEMARET, J. C., COLLET, R., ENGEL, E., and MACH, R. S.**: Study on the variations of the exchangeability of sodium by radiosodium in the course of treatment of edema; comparison with balance method (ab), Sept., 493

—See ENGEL, E., and MACH, R. S.

**DEMOULIN, M.**: Phlebographic study of the mediastinum (ab), Nov. 803

**DENMARK**  
—late results of radium therapy in cervical carcinoma: clinical-statistical study on 798 patients treated at The Radium Centre, Copenhagen, during the period 1922-1929 (ab), Bent Sørensen, Aug., 318

**DERMATOMYOSITIS**  
—dermatomyositis with pulmonary lesions (ab), Jerome Goldfischer and Eli H. Rubin, Nov., 803

**DERMOID**. See Tumors, dermoid

**DETTERLING, RALPH A., Jr.** See HASE, OTTHEINRICH

**DEUEL'S HALO SIGN**. See Fetis, death of

**DEVINE, KENNETH D.** See SCANLON, PAUL W.

**DEWEES, JAMES A., TERRY, ROGER, and SCHWARTZ, SEYMOUR L.**: Leiomyoma of the greater saphenous vein with preoperative localization by phlebography (ab), Sept., 472

**DEXTROCARDIA**. See Heart, displacements

**DFP**. See Radioactivity, radiophosphorus

**DIABETES MELLITUS**  
—observations of neuropathic (Charcot) joints occurring in diabetes mellitus (ab), Julian E. Jacobs, Aug., 310

**DIAGNINOL**. See Brain, blood supply

**DIAMOND, HENRY D.** See ROSENBERG, SAUL A.

**DIAMOND, MONROE THOMAS**: The syndrome of exophthalmos, hypertrophic osteoarthropathy and localized myxedema: a review of the literature and report of a case (ab), Nov., 816

**DIAPHRAGM**  
See also Hernia, diaphragmatic  
—interposition of loop of ileum between dome of diaphragm and liver (ab), M. G. Varadarajan, Dec., 947

—meaning of gas bubble projected above level of diaphragm (ab), E. Koppenstein, Dec., 946

**rupture**  
—incarceration of stomach and intestine after traumatic rupture of diaphragm (ab), F. Kummerle, Sept., 474

—problem of ruptured diaphragm (ab), Philip E. Bernats et al., Aug., 309

**DIGESTIVE SYSTEM**  
See also Gastrointestinal Tract; Stomach; etc.

—radiological investigation of small intestine in tropical idiopathic malabsorption (ab), D. E. Paterson and S. J. Baker, Aug., 303

**H.**: Re-  
agnosis in

**N.**: Dose  
-ray range;  
phantoms;  
the oscilla-  
-y tuber-  
**DDOCK,**  
-fects by  
**PACK,**  
-hypotonia  
-taining  
432

-of cal-  
-Altera-  
-ysteine,  
-marrow

**ARET:**  
-altered  
case in

**cinoma**  
-peptic

**and**  
-buccal  
-k. A

**d pal-**  
-with

**ACH,**  
-ability  
-ent of  
493

**angene-**  
-es in

**num**

**oma:**  
-The  
-1929

**rome**

**ICH**

**ITZ,**  
-ious  
-phy

**ing**

**ph-**  
-a

**gm**

**gm**

**tic**

**tz**

**al.**

**HODINE.** See Brain, blood supply

**di SANT'AGNESE, PAUL A.** See REEMTSMA, KEITH

**DISCOGRAPHY.** See Spine, intervertebral disks

**DITE, B.** See NETTL, S.

**DIVERTICULA.** See Bladder; Gallbladder; Intestines; Meninges; Pericardium; etc.

**DIXON, W. M.** See STRADLING, PETER

**DOBEN, GLEN D.** Leiomyosarcoma of the nasopharynx (ab), Aug., 288

**DORERTY, D. G.** See URSO, PAUL

**DORERTY, J. F.** See COX, H. T.

**DORN, KAI:** Tilt phlebography. Retrograde phlebography by ascending injection (ab), July, 137

**DOIG, A. T.** See HARDING, H. E.

**DOLAN, H. S.** See SKORYNA, STANLEY C.

**DOLPHIN, G. W., GALE, N. H., and BRADSHAW, A. L.** Investigations of high energy electron beams for use in therapy (ab), Nov., 828

-See BOAG, J. W.

**DONNAN, M. G. F.** Torulosis (ab), Nov., 822

**DOSIMETERS AND DOSIMETRY**

See also Lungs, cancer; Radioactivity, radiocobalt; Radium; Roentgen Therapy; etc.

-integral doses at 200 kv and 8 Mev (ab), D. K. Bewley et al, Dec., 959

-radiation dosimetry with fluorods (miniature glass rod dosimetry), Morris Hodara, Milton Friedman and Gerald J. Hine, Nov., 693

**DOUB, HOWARD P.** See GISH, JAMES R.

**DOWDY, ANDREW H.** See FALKENBACH, KARL H.

-See McFALL, RUSSELL A.

**DREIZEN, SAMUEL, SNODGRASSE, RICHARD M., WEBB-PELLOE, HAMILTON, and SPIES, TOM D.** The retarding effect of protracted undernutrition on the appearance of the postnatal ossification centers in the hand and wrist (ab), Oct., 655

**DREY, L.** The rate of growth in length of the long bones, in certain pathological conditions. (An x-ray study) (ab), Oct., 655

**DRUTZ, EILEEN.** See FRIEDMAN, NATHAN B.

**DUCTUS ARTERIOSUS**

-functional diagnosis of patent ductus arteriosus studied by cineangiography in 53 cases (ab), Frank L. Campe et al, Sept., 468

-high pressure patent ductus arteriosus; 3 cases (ab), Jerome H. Kay et al, Dec., 944

-patent ductus arteriosus with pulmonary hypertension simulating ventricular septal defect: diagnostic criteria in 10 surgically proved cases (ab), Juan L. Gonzalez-Cerna and C. Walton Lillehei, Sept., 468

-spontaneous aneurysm of ductus arteriosus; review and report of tenth adult case (ab), Bruce Cruickshank and R. M. Marquis, Oct., 646

**DULCOLAX.** See Colon, roentgenography

**DUMPING SYNDROME.** See Stomach, surgery

**DUNBAR, J. S.** See MacEWAN, D. W.

**DUODENUM**

-comparative histological study of duodenal damage produced by fission neutrons and  $\text{Co}^{60}$  gamma-rays (ab), S. Lesser and H. Vogel, Jr., Oct., 667

-hyperplasia of Brunner's glands (ab), Maurice L. van der Reis et al, Dec., 947

**distalization.** See Duodenum, obstruction

**hematoma**

-acute obstruction of small intestine secondary to hematoma in children (ab), A. L. Mestel et al, Nov., 812

**obstruction**

-duodenal megalobulbus and annular pancreas (ab), E. E. T. Taylor, Nov., 811

**roentgenography.** See Duodenum, stricture; Peptic Ulcer stricture

-duodenal stenosis due to postbulbar ulcer: comparison of radiological and surgical findings (ab), D. E. Patterson and D. M. Hancock, Oct., 650

**tumors**

-leiomyoma of duodenum (ab), W. N. Coombes, July, 139

**ulcers.** See Peptic Ulcer

**DUOGRANIN.** See Gallbladder, roentgenography

**DURANT, THOMAS M.** See WINTERS, WILLIAM

**DU SAULT, LUCILLE A.** A simplified method of treatment planning, July, 85

-See GISH, JAMES R.

**DUVAL, F.** Primary retroperitoneal tumours (ab), Aug., 314

**DuVAL, F. W.** See MUSTARD, W. T.

**DWIGHT, SELENA A.** See CORIELL, LEWIS L.

**DYKEN, MARK:** Pneumoencephalography with direct injection and positional directing of air (ab), Nov., 799

**DYSCHONDROPLASIA**

-dyschondroplasia with multiple hemangioma (Maffucci's syndrome) (ab), Kurt Marberg et al, Sept., 477

**DYSKINESIA.** See Biliary Tract

**DYSOTOSIS, CLEIDOCRANIAL.** See Cranium, ossification

**DYSPHAGIA**

-dysphagia caused by hypertrophic changes in cervical spine; 2 cases (ab), Oliver H. Bearns and Herbert W. Schmidt, Dec., 950

**DYSPLASIA, CHONDROECTODERMAL.** See Ectodermal Defect

**EAR**

-congenital anomalies of sound-conducting organs (ab), Pekka Soila, Sept., 465

**EARN, ALBERT A., FREER, J. L., and CAIRNS, D. R.** One radiograph to exclude placenta praevia (ab), Aug., 311

**EASTCOTT, H. H. G., and SUTTON, DAVID:** Chronic dissecting aneurysm of the aorta diagnosed by aortography (ab), Sept., 470

**EASTERDAY, O. D.** See BOND, V. P.

**ECCLESTON, H. N., Jr.** See ALBERT, SOLOMON N.

**ECHINOCOCCOSIS**

See also Brain, echinococcosis; Heart, echinococcosis -brucellosis and echinococcosis in Argentina; a short clinical and radiological report (ab), H. H. Weber, Aug., 315

**ECKER, H.** See BLOMFIELD, G. W.

-See WILSON, G. M.

**ECTODERMAL DEFECT**

-chondroectodermal dysplasia (Ellis-van Creveld syndrome); 2 cases (ab), Harris L. Smith and Albert M. Hart, July, 142

**EDEIKEN, JACK.** See FRIEDENBERG, Z. B.

**EDELSTYN, G. A., GLEADHILL, C. A., LYONS, A. R., RODGERS, H. W., TAYLOR, A. R., and WELBOURN, R. B.** Hypophysectomy combined with intrasellar irradiation with yttrium-90. Preliminary communication (ab), Aug., 322

**EDEMA**

See also Lungs, edema

-study on variations of exchangeability of sodium by radio-sodium in course of treatment of edema: comparison with balance method (ab), J. C. Demanet et al, Sept., 493

**EDGCOMB, JOHN H.** See CRAMER, LESTER M.

**EDHOLM, PAUL:** Emptying of the human gallbladder under the stimulus of cholecystokinin (ab), Oct., 653

**EDITORIALS**

Cumulative Index IV, Oct., 620

Forty-fifth Annual Meeting, Radiological Society of North America, Laurence L. Robbins, Sept., 434

massive osteolysis, Arthur Purdy Stout, Sept., 435

Ninth International Congress of Radiology, Nov., 787

operations research and optimal radiology, Steven E. Ross, Oct., 618

pulmonary findings in the collagen diseases, William R. Eyer, July, 109

radiation biology, Henry S. Kaplan, Aug., 268

radiation control at the grassroots, Richard H. Chamberlain, Dec., 927

**EDLING, N. P. G., and HELANDER, C. G.**: Nephrographic effect in renal angiography. An experimental study in dogs (ab), Nov., 809

-See HELANDER, C. G., PERSSON, F., and ASHEIM, A.

**HELANDER, C. G., PERSSON, F., and ASHEIM, A.**: Renal function after aortography with large contrast medium doses. An experimental study in dogs (ab), Sept., 470

**EDUCATION**

-cardiovascular roentgenology fellowship, University of California, Dec., 929

-course in gastrointestinal radiology, University of Minnesota, Aug., 274

-course in medical uses of radioactive isotopes, Queens Hospital Center, New York, Dec., 929

-course in operative radium therapy, Queens Hospital Center, Aug., 275

-course in radioactive isotopes for technicians, Queens Hospital Center, July, 115

-James Picker Foundation fellowships, Nov., 790

-Los Angeles Radiological Society midwinter conference, Dec., 929

-postgraduate course in radiology, University of Kansas Medical Center, Dec., 929

**EDWARDS, DAVID.** See CAINE, MARCO

**EEK, S., and HAGELSTEEN, H.**: Torsion of the stomach as a cause of vomiting in infancy (ab), Aug., 301

**EFFUSIONS**

See also Ascites; Pericarditis, with effusion; Pleurisy, with effusion

-clinical evaluation of radioactive chrome phosphate in control of malignant pleural and ascitic effusions, Charles R. Perryman, Edward J. Pavsek and John D. McAllister, Dec., 805

**EHRLICH TUMOR** See Tumors, experimental

**EISENMENGER'S COMPLEX.** See Heart, abnormalities

**EKMAN, HANS:** Views on the value of urethrocystography in determining indications for surgery in prostatic hypertrophy (ab), Sept., 483

**ELBOW**

-displacement of fat pads in disease and injury of elbow: a new radiographic sign, R. C. Bledsoe and J. L. Izentark, Nov., 717

**ELDRED, EARL:** The response of eosinophils to total-body x-radiation of the monkey (ab), Dec., 965

**ELECTROKYMOGRAPHY.** See Heart, beat

**ELECTRONS**

-alteration of beta-radiation lesions of skin by cysteine, nitrite, hypoxia, spleen homogenate, and bone-marrow homogenate (ab), A. K. Davis et al, July, 160

**ELECTRONS—cont.**

- burn following accidental exposure to high-energy radiation (ab), Lester M. Cram et al, Dec., 963
- clinical experience with high-speed electrons in cancer therapy, Erich M. Uhlmann, July, 76
- effect of dose rate on genetic damage from fast electrons in *Drosophila* sperm (ab), Armon F. Yanders, Nov., 838
- improvement of diagnostic value of photofluorographic films by electronic means; preliminary report, Myron Forman, Anthony B. Borden and J. Gershon-Cohen, Nov., 774
- integral doses at 200 kv and 8 Mev (ab), D. K. Bewley et al, Dec., 959
- investigations of high-energy electron beams for use in therapy (ab), G. W. Dolphine et al, Nov., 828
- radiation dosimetry by transparent plastics (ab), J. W. Boag et al, Nov., 827

**ELCRORETINOGRAF.** See Retina**ELIASOPH, JOAN.** See MARSHAK, RICHARD H.**ELKIN, MILTON.** See SCHEINBERG, LABE**ELKINS, H. B.** See FLOCKS, R. H.**ELLINGER, F.** Short and long-term observations concerning the effect of homologous and heterologous cell-free spleen extracts on radiation mortality in mice and guinea pigs (ab), Dec., 965**ELLIOTT, GLADDEN.** See GOLDRING, DAVID**ELLIS, F. HENRY, JR.** See BRUWER, ANDRE J.**ELLIS-VAN CREVELD SYNDROME.** See Ectodermal Defect**EMBOLISM**

- danger of embolism with oily contrast media. Study of problem of media in hysterosalpingography (ab), R. Frischkorn, Dec., 953
- fatal venous intravasation of barium during a barium enema, Lee S. Rosenberg and Archie Fine, Nov., 771
- studies to detect escape of amniotic fluid into maternal circulation during parturition (ab), Richard A. Sparre and Jack A. Pritchard, Sept., 491
- pulmonary
  - old massive pulmonary embolism (ab), H. U. Zollinger and L. Hensler, Dec., 945
  - unilateral pulmonary embolism with increased compensatory circulation through unoccluded lung: roentgen observations, Felix G. Fleischner, Oct., 591

**EMBRYO**

- effects of low-dose x-radiation on mouse embryo (ab), Ujiro Murakami and Yoshiro Kameyama, July, 156

**EMPHYSEMA**

- pulmonary
  - emphysema and the lungs of the aged: a clinical study; preliminary report (ab), Edgar Mayer et al, July, 130
  - experimental pulmonary emphysema: production of emphysematous bullae in rabbit by infection with tuberculosis (ab), John W. Bell, Oct., 644
  - unilateral pulmonary "emphysema," Isadore Katz and Stephen Wagner, Sept., 362

**ENCEPHALOGRAPHY.** See Brain, roentgenography**ENDOMETRIOSIS**

- radiographic features of rectosigmoid endometriosis (ab), Gordon J. Culver et al, Oct., 651

**ENDOMETRIUM.** See Endometriosis; Uterus, cancer**ENDOSCOPY**

- endoscopic aspects of primary tuberculosis in children (ab), John F. Daly, Oct., 641

**ENDOTOXIN**

- endotoxin treatment and x-irradiation in mice bearing transplanted tumors (ab), Joanne W. Hollcroft and Willie W. Smith, July, 159

**ENEMAS.** See Intestines, roentgenography; Intussusception**ENGEL, E.** See DEMANET, J. C.**ENGELS, EDWARD P.** See GAY, BRIT B., JR.**ENGELFELDT, BENGT, and LAGERGREN, CURT.** Nephrocalcinosis: a roentgenologic, biophysical and histologic study (ab), Sept., 482**ENGLE, ROBERT BRAY.** Roentgen treatment of granulosa cell carcinoma of the ovary (ab), Sept., 486**ENTENMAN, CECIL.** See JACKSON, KENNETH L.**ENTERITIS.** See Intestines, diseases**ENVIRONMENT**

- environmental influences on healing of cervical carcinoma (ab), Paul Hess, July, 150

**EOSINOPHILS**

- response of eosinophils to total-body x-radiation of monkey (ab), Earl Eldred, Dec., 965

**EPIDERMAL.** See Tumors, epidermoid**EPIDURAL SPACE.** See Abscess, epidural**EPIPHYES**

- different stages of radiological epiphyseal union (ab), I. D. Bajaj, Aug., 310
- experimental epiphyseal injury and Freiberg's disease (ab), G. T. F. Braddock, Dec., 952
- nonunion of epiphysis of lateral condyle of humerus (ab), C. C. Jeffery, July, 145
- study of experimental trauma to distal femoral epiphysis in rabbits—II (ab), J. Albert Key and Lee T. Ford, July, 146

**ERICH, JOHN B.** See SCANLON, PAUL W.**ERNST, HELMUT, IGLAUE, EDUARD, KRONSHWITZ, HELMUT, and SPODE, ERNST.** Treatment of lung tumors with a radioactive gold-carbon suspension; animal experiments (ab), Sept., 491**INDEX****ERYTHROBLASTOSIS, FETAL**

- prenatal roentgen diagnosis of fetal hydrops (ab), Eugene M. Savignac, Aug., 312

**ERYTHROCYTES**

- collective review: studies of resorption of chromium-51 tagged erythrocytes from peritoneal cavity; the absorption of fluid and particulate matter from peritoneal cavity (ab), Donald B. Rochlin et al, Sept., 490
- effect of anemia and transfusion polycythemia on phosphorus and iron uptake in erythrocyte precursors in rat bone marrow, studied by means of a triple tracer technic with  $\text{P}^{32}$ ,  $\text{Fe}^{59}$  and  $\text{Cr}^{51}$  (ab), Joseph P. Kriss et al, Dec., 962
- effect of internal emitters on red cell survival in beagle dogs (ab), John E. Parkinson, Nov., 836
- effect of single and multiple doses of  $\text{Co}^{60}$  gamma-radiation and fission neutron radiation on incorporation of  $\text{Fe}^{59}$  into rat erythropoietic system (ab), W. A. Rambach et al, Dec., 965
- improved method of labeling red cells with radioactive phosphorus (ab), P. L. Molisson et al, Aug., 323
- life span of red cells in rat and mouse as determined by labeling with  $\text{DFP}^{32}$  in vivo (ab), L. M. van Putten, July, 154
- plasma protein-thyroid hormone complex in man. III. Further studies on use of the in vitro red blood cell uptake of  $\text{I}^{131}\text{-triiodothyronine}$  as diagnostic test of thyroid function (ab), Milton W. Hamolsky et al, Nov., 829

- splenectomy in hemolytic anemia: results predicted by body scanning after injection of  $\text{Cr}^{51}$ -tagged red cells (ab), Paul R. McCurdy and Charles E. Rath, Aug., 322

- studies on anemia of tumor-bearing animals. I. Distribution of radioiron following injection of labeled erythrocytes (ab), Robert E. Greenfield et al, Sept., 492
- studies to detect escape of amniotic fluid into maternal circulation during parturition (ab), Richard A. Sparre and Jack A. Pritchard, Sept., 491
- thyroid function in supraventricular tachycardia: turnover of intravenously infused  $\text{I}^{131}$ -labeled thyroxine and the red blood cell uptake of  $\text{I}^{131}$ -labeled  $\text{I}$ -triiodothyronine (ab), George S. Kurland et al, Nov., 829

- ESCHER, DORIS J. W., SHAPIRO, JEROME H., RUBINSTEIN, BERTA M., HURWITT, ELLIOTT S., and SCHWARTZ, SIDNEY P.** Perforation of the heart during cardiac catheterization and selective angiography (ab), July, 136
- See **JACOBSON, HAROLD G.**

**ESOPHAGITIS.** See Esophagus**ESOPHAGOSCOPY.** See Esophagus**ESOPHAGUS**

- esophageal webs; report of 58 cases and an attempt at classification (ab), Munir H. Shamma'a and Edward B. Benedict, Aug., 300
- lower esophageal ring or groove (ab), C. D. T. MacLean, July, 138

**cancer**

- advantage of aimed pendulum roentgen therapy of esophageal carcinoma (ab), Werner Hellriegel, Dec., 957

- value of cinematography in diagnosis of malignant strictures of esophagus (ab), F. R. Berridge and D. McC. Gregg, July, 137

**distillation**

- bronchopulmonary complications revealing an unrecognized megaeosophagus (ab), J. Le Melletier et al, Nov., 803

**fistula.** See Fistula**foreign bodies.** See Foreign Bodies**inflammation**

- comparison between radiology and esophagoscopy in investigation of reflux esophagitis (ab), Martin Spiro, Sept., 473

**motility**

- simultaneous fluorocinematography and intraluminal pressure measurements in study of esophageal motility (ab), Gaston Vantrappen et al, Nov., 810

**mycosis.** See Moniliasis

- See also other subheads under Esophagus

- observations on radiologic anatomy of esophagogastric junction, Alan S. Johnstone, Oct., 501

- radiologic aspects of progressive scleroderma (ab), J. Pasquier, Sept., 473

- x-ray examination (ab), Frederic E. Templeton, Sept., 472

**structure.** See Esophagus, cancer**varix**

- diagnosis of esophageal varices by new radiologic method; preliminary report, M. H. Nathan, Nov., 725

- dynamic changes of varicose esophagus: cineradiographic study with image intensifier (ab), L. Ciarpaglini and G. Iannaccone, Dec., 946

- ESPINO-VELA, J.** Rheumatic heart disease associated with atrial septal defect: clinical and pathologic study of 12 cases of Lutembacher's syndrome (ab), Dec., 942

- PORRILLO, B., RUBIO, V., and ARANDA, S.** Combined auricular and ventricular septal defects: a study of five cases, with postmortem confirmation in three (ab), Oct., 644

- ESSER, C.** Bony bridges following transverse process fractures of the lumbar vertebrae (ab), Dec., 950

- ESTHESIONEUROBLASTOMA.** See Tumors, neuroblastoma

Eugene

mium-51  
absorp-  
tritonealn phos-  
sors in  
tracer  
Kris

beagle

-radi-  
ation  
bambach-reactive  
putten,

III.

and cell  
rest of  
Nov.,ed by  
cells322  
tribu-  
thromo-ernal  
Sparrturn-  
e and  
hyd-BIN.  
and  
heart  
ardi-at  
B.

ean,

pha-

rie-  
c.og-  
ov.,in-  
ro,es-  
b),us  
ics-  
72

I;

ic

h  
ofy  
e**ETHMOID SINUS**

-intracranial extension of tumors of ethmoid, orbit, and rhinopharynx: angiographic study (ab), G. J. Melot et al, July, 129

**ETTER, LEWIS E., SIDHU, S. S., and CROSS, L. C.:** Radiation dose reduction in dental roentgenography (ab), Oct., 670**EVANS, E. ANN:** A method for construction of isodose charts from minimum experimental data (ab), Nov., 828-See **MARTIN, J. H.****EVANS, K. T. See BOOTH, C. C.****EVANS, MELVIN H. See ROSS, RICHARD S.****EVANS, TITUS C. See PETERSON, RICHARD E.****EVANS, WILLIAM, and SHORT, D. S.:** Pulmonary hypertension in congenital heart disease (ab), Aug., 293**EVERETT, HOUSTON S. See BRACK, C. BERNARD****EWING'S SARCOMA. See Tumors, Ewing's****EXOPHTHALMOS**

-syndrome of exophthalmos, hypertrophic osteoarthropathy and localized myxedema; review of literature and report of case (ab), Monroe T. Diamond, Nov., 816

**EXTREMITIES**

See also Ankle; under names of bones

**blood supply. See also Varicose Veins**

-role of aortography in determination of operability in arteriosclerosis of lower extremities (ab), Edwin J. Wylie and Leon Goldman, July, 133

-tilt phlebography of normal legs (ab), Frits R. Mathiesen, Oct., 648

-tilt phlebography: reliable method for diagnosing incompetent communicating veins (ab), Frits R. Mathiesen, Sept., 472

-tilt phlebography: retrograde phlebography by ascending injection (ab), Kai Dohn, July, 137

**tumors**

-supervoltage radiation for sarcomata of pelvis and lower extremities; preliminary report (ab), G. Edmund Haggart et al, July, 151

**EYES**

See also Lacrimal Organs; Orbit; Pterygium; Retina; Vision

-ocular effects of radiation (ab), David G. Cogan, Aug., 324

**foreign bodies**

-intracocular foreign body (ab), Arnold I. Turtz and Alfred Mamlok, Aug., 287

**tumors**

-use of radioactive phosphorus for detection of intracocular tumors (ab), R. C. Tudway and A. Palin, Aug., 321

**EWLER, WILLIAM R., WAYNE, DAVID L., and RHO-  
DENBAUGH, JOHN E.:** The importance of the lateral view in the evaluation of left ventricular enlargement in rheumatic heart disease, July, 36**EVSHOLDT, K. G.:** Phlebography and its significance in the diagnosis of disease of the veins (ab), Oct., 647**F****FAGERBERG, STIG:** Tomographic analysis of depressed fractures within the knee joint, and of injuries to the cruciate ligaments (ab), Sept., 479**FAIRLEY, KEITH D. See CLARKE, K. H.****FALKENBACH, KARL H., ZHEUTLIN, NORMAN,  
DOWDY, ANDREW H., and O'LOUGHLIN, BER-  
NARD J.:** Pulmonary hypertension due to pulmonary arterial coarctation, Oct., 575**FALLOPIAN TUBES****roentgenography**

-complications of hysterosalpingography (ab), John E. Wolz et al, Aug., 311

-danger of embolism with oily contrast media. Study of problem of media in hysterosalpingography (ab), R. Frischkorn, Dec., 953

-experience with new contrast media for hysterosalpingography (ab), H. E. Reiss and Maria Grossmann, Nov., 819

-role of gynecography in evaluation of infertile woman (ab), Irving F. Stein, Sr., July, 147

**FALLOT'S TETRALOGY. See Heart, abnormalities****FAMILIAL CONDITIONS**

-symmetric familial cerebral calcification (ab), H. J. Schafroth, Dec., 928

**FARBER, SIDNEY. See D'ANGIO, GIULIO J.****FARMERS AND FARMING**

-chronic pulmonary insufficiency secondary to silo-filler's disease (ab), Gilbert M. P. Leib et al, Aug., 290

**FARRAN, HELEN E. A.:** The immediate uptake of radioactive iodine as a test of thyroid function (ab), Oct., 664**FASCITIS**

-peritoneal (Gerota's) fascitis (ab), John A. Hutch et al, Nov., 819

**FASSBENDER, C. W., HÄUSSLER, G., and STÖSEL, H.  
G.:** Results of abrodil myelography in prolapse of the lumbar intervertebral disk (ab), Dec., 950**FAT**-absorption, transport, and deposition of fat; application of new method for determination of  $^{131}\text{I}$ -lipid activity in dogs and man (ab), David A. Turner, July, 153

-acute pancreatitis with peritoneal fat necrosis: roentgen diagnosis (ab), Thomas B. Merner, July, 141

-cystic fibrosis of pancreas: intestinal absorption of fat and fatty acid labeled with  $^{131}\text{I}$  (ab), Keith Reemtsma et al, Oct., 652

-displacement of fat pads in disease and injury of elbow: a new radiographic sign, R. C. Bledsoe and J. L. Izensztark, Nov., 717

-fat absorption from human gastrointestinal tract in patients undergoing radiation therapy, R. J. Reeves, A. P. Sanders, J. K. Isley, K. W. Sharpe and G. J. Baylin, Sept., 398

-fatty meal in oral cholecystography: re-evaluation with comments on "tumors" of gallbladder, and on its Rokitansky-Aschoff sinuses (ab), Christian V. Cimmino, Dec., 949

-modification of  $^{131}\text{I}$  triolein test of fat absorption utilizing a capsule test meal (ab), J. K. Isley, Jr., et al, Sept., 489-study of fat absorption utilizing  $^{131}\text{I}$ -labeled corn oil in infants and children with and without steatorrhea (ab), Samuel Spector et al, Oct., 665**FEASTER, B. L. See HAHN, P. F.****FEDER, BERNARD H. See KURNICK, N. B.****FEBLEMINDEDNESS**

-observations on congenital anomalies in teeth and skull in 2 groups of mental defectives (comparative study) (ab), Richard Spitzer and R. L. Quilliam, Sept., 465

**FEINBERG, S. B.:** Arteriography and cardioangiography (ab), July, 136**FELDMAN, MICHAEL, and YAFFE, DAVID:** Immunogenetic studies on x-irradiated mice treated with homologous hematopoietic cells (ab), Sept., 500**FELL, STANLEY C., SCHEIN, CLARENCE J., BLOOM-  
BERG, ALLAN E., and RUBINSTEIN, BERTA M.:** Congenital diverticula of the pericardium (ab), Nov., 806**FELLOWSHIPS. See Education; Picker Foundation****FELSON, BENJAMIN:** Some less familiar roentgen manifestations of intrathoracic histoplasmosis (ab), Nov., 802

Uncommon roentgen patterns of pulmonary sarcoidosis (ab), Aug., 289

**FLEISCHNER, FELIX G., McDONALD, JOHN R., and  
RABIN, COLEMAN B.:** Some basic principles in the diagnosis of chest diseases, Nov., 740**FELTON, LESTER M.:** Should intravenous pyelography be a routine procedure for children with cryptorchism or hypospadias? (ab), Dec., 954**FEMUR**

-congenital short femur: simple femoral hypoplasia (ab), P. A. Ring, Dec., 951

-torsion of femur: follow-up report on use of Dunlap method for its determination (ab), A. R. Shands, Jr., and Marshall K. Steele, July, 145

**blood supply**

-circulatory disturbances in osteoarthritis of hip: a venographic study (ab), Anders Hult, Nov., 817

-coxa plana (ab), Beckett Howorth, Nov., 818

-femoral head phlebography: a method of predicting viability (ab), Anders Hult, July, 146

-vessel anatomy of upper femur end with special regard to mechanism of origin of different vascular disorders (ab), Anders Hult, Sept., 479

**epiphysis. See Epiphyses****osteomyelitis**

-osteomyelitis of femoral neck (ab), G. Brantschen, Oct., 658

**tuberculosis**

-tuberculosis of femoral neck and greater trochanter (ab), R. T. Ahern, July, 146

**FERRARIO, I.:** Anomalous drainage of all the pulmonary veins into the left innominate vein with interauricular communication: so-called Taussig-Snellen-Albers syndrome (ab), Sept., 471**FERREBEE, JOSEPH W., and THOMAS, E. DONNALL:** Radiation injury and marrow replacement: factors affecting survival of the host and the homograft (ab), Sept., 497-See **THOMAS, E. DONNALL****FERTILITY**

-relative effectiveness of neutrons of 1.4-Mev and 14-Mev energies and gamma rays in reduction of fertility in male mouse (ab), J. F. Spalding et al, July, 158

**FETUS**

See also Erythroblastosis, Fetal

-accuracy of radiological estimation of fetal age (ab), P. W. Verco, Oct., 659

-acute leukemia in infant following excessive intrauterine irradiation (ab), F. W. Gunz et al, Sept., 495

-influence of cortisone on teratogenic activity of x-radiation (ab), D. H. M. Woollam et al, Nov., 838

-method of transfer of labor contractions to contents of uterus (ab), G. Narik, Dec., 952

**death of**

-Deuel's halo sign (ab), Olov Fr. Holm, Aug., 312

-intravascular gas in radiological diagnosis of fetal death in utero (ab), Paul Ross, Aug., 312

**FIANDRA, O., BARCIA, A., CORTES, R., LOPEZ SOTO,  
R., STANHAM, J., and LOMBARDERO, M.:** Partial anomalous pulmonary venous drainage (ab), Sept., 470**FIBROSARCOMA. See Sarcoma, fibrosarcoma****FIBROSIS. See Lungs; Mediastinum; Pancreas****FICHARDT, T.:** Screening urethrocystography of adult Bantu males under manometric control. Normal and pathological findings (ab), Dec., 953

**FICHMAN, M.** See **GREENFIELD, M. A.**

**FIELD, EDWIN O.** See **KRISS, JOSEPH P.**

**FINBY, NATHANIEL.** See **LEE, ROBERT E.**

**FINE, ARCHIE.** See **ROSENBERG, LEE S.**

**FINGERS AND TOES**

- anteroposterior projection of carpometacarpal joint of thumb by radial shift of carpal tunnel view (ab), Michael Burman, Aug., 310

**FINK, BURTON W., MOSS, ARTHUR J., ADAMS, FOREST H., and O'LOUGHLIN, BERNARD J.**: Right heart catheterization in infants and children. Analysis of data obtained in the study of 218 patients (ab), Oct., 644

**FINLAND**

- iodine metabolism of endemic goiter on Åland Islands (Finland) (ab), B.-A. Lamberg et al., Sept., 490

**FIRFER, RAYMOND.** See **BAKER, WILLIAM J.**

**FISCHER, E.**: Malformation of the costal cartilages (ab), July, 130

**FISH, ROBERT G.** See **KENNEDY, WILLIAM M.**

**FISHER, MONICA.** See **BLOMFIELD, G. W.**

**FISTULA**

- arteriovenous**
  - congenital aneurysm of coronary artery with arteriovenous fistula (ab), Troels Munkner et al., Aug., 294
  - congenital arteriovenous aneurysms (ab), F. S. Cross et al., Aug., 294
  - hypertension in unilateral renal artery stenosis with arteriovenous fistula: arteriographic demonstration in 18-year-old male (ab), G. Gollmann, July, 135
  - posterior fossa arteriovenous aneurysm with occlusion of a cerebral artery (ab), Robert D. Teasdall, July, 129
  - pulmonary arteriovenous fistula associated with capillary telangiectasia (Rendu-Osler-Weber disease); case illustrating use of metal casting for demonstrating the lesion (ab), Israel Steinberg et al., Oct., 647
- biliary**
  - metabolism of progesterone-4-C<sup>14</sup> in a postmenopausal woman with biliary fistula (ab), W. G. Wiest et al., Sept., 490
- esophagobronchial**
  - esophagobronchial fistula (ab), E. Schwarz and M. Berger, Aug., 300
- esophagotracheal**
  - acquired esophagotracheal fistula secondary to foreign body in esophagus (ab), Yosh Maruyama et al., Nov., 810
  - H-type tracheoesophageal fistula (ab), Alden H. Miller, Oct., 648

**FITCH, EDWARD A.** See **LEHMAN, J. STAUFFER**

**FITZPATRICK, HUGH F.** See **BELL, A. L. LOOMIS, JR.**

**FLATMAN, G. E.**: Some observations on the treatment of certain radio-resistant tumours (ab), Nov., 826

**FLEISCHNER, FELIX G.**: Unilateral pulmonary embolism with increased compensatory circulation through the unoccluded lung; roentgen observations, Oct., 591

—See **FELSON, BENJAMIN**

**FLOCKS, R. H., CULP, D. A., and ELKINS, H. B.**: Present status of radioactive gold therapy in management of prostatic cancer (ab), Nov., 830

**FLUORODS**

- radiation dosimetry with fluorods (miniature glass rod dosimetry), Morris Hodara, Milton Friedman and Gerald J. Hine, Nov., 693

**FLUOROSCOPY.** See **Cineroradiography; Pulmonary Valve; Roentgen Rays, fluoroscopy**

**FOCAL SPOT.** See **Roentgen Rays, technic**

**FOGEL, MARIA, SOMOGYI, ZSUZSA, and GACS, JANOS.**: Transposition of the pulmonary veins (ab), Nov., 807

**FOLIC ACID ANTAGONISTS**

- effect of combined irradiation and chemotherapy on cancer growth, with special reference to studies with folic acid analogues, Merle K. Loken, Young S. Kim, Donn G. Mosser and James F. Marvin, Aug., 166

**FOOD**

- effect of food on 3-hour thyroidal uptake of I<sup>131</sup> in human subjects (ab), David J. Turell et al., Sept., 489
- role of food consumption in mortality response of irradiated rats subjected to prolonged cold exposure (ab), Bernard D. Newsom and Donald J. Kimeldorf, Nov., 838
- transmission of radioactive strontium through food from open water reservoirs into human organism (ab), A. N. Marei et al., Nov., 833

**FOOT**

- observations of neuropathic (Charcot) joints occurring in diabetes mellitus (ab), Julian E. Jacobs, Aug., 310
- vascular syndromes from dilatation of arteriovenous communications of sole of foot (ab), Edmond Malan, Sept., 472

**FORAMEN OVALE.** See **Heart, abnormalities**

**FORD, LEE T.** See **KEY, J. ALBERT**

**FOREIGN BODIES**

- See also **Eyes**
- radiopacity of glass foreign bodies, with report of case of injury of cauda equina by fragments of glass (ab), W. Bryan Jennett and James A. Watson, Sept., 478
- in air and food passages
- acquired esophagotracheal fistula secondary to foreign body in esophagus (ab), Yosh Maruyama et al., Nov., 810

**FORMAN, MYRON, BORDEN, ANTHONY BOREADIS, and GERSHON-COHEN, J.**: Improvement of diagnostic value of photofluorographic films by electronic means. A preliminary report, Nov., 774

**FORREST, A. P. M., BLAIR, D. W., and VALENTINE, J. M.**: Screw-implantation of the pituitary with yttrium-90 (ab), Aug., 321

**FORREST, A. W.** See **REESE, A. B.**

**FORSIUS, P. I.** See **LAMBERG, B.-A.**

**FORSBERG, A.** See **HELDÉ, M.**

**FORSYTHE, W. I., and WHELAN, R. F.**: The occurrence and significance of vesicoureteral reflux in children (ab), Oct., 660

**FORSYTHE, WILLIAM E., HUFFMAN, WILLIAM L., SCHILDT, PAUL J., and PERSKY, LESTER.**: Spontaneous extravasation during urography (ab), Sept., 483

**FOZZARD, J. A. F.** See **FULLER, A. P.**

—See **WOOLAM, D. H. M.**

**FRACTURES.** See **Calcaneus; Knee; Spine**

**FRANCE, LLOYD C.** See **SZILAGYI, D., EMERICK de FRANCISCIS, PIETRO, and SCANZIANI, EMILIO.**: Total-body x-irradiation and scanectomy in guinea-pigs, Sept., 424

**FRANKEL, SAUL A., and GERMAN, WILLIAM J.**: Glio blastoma multiforme. Review of 219 cases with regard to natural history, pathology, diagnostic methods, and treatment (ab), July, 127

**FRANTZ, F. S., Jr., and WYCKOFF, H. O.**: Attenuation of scattered cesium-137 gamma rays, Aug., 263

**FRASER, ROBERT G.** See **KEOGH, RICHARD K.**

—See **SPROUL, R. D.**

**FRASER, JOE W., Jr.**: Malignant lymphomas of the gastrointestinal tract (ab), Dec., 958

**FREEDBERG, A. STONE.** See **HAMOLSKY, MILTON W.**

—See **KURLAND, GEORGE S.**

**FREEMAN, BROMLEY S.**: Sialography in children (ab), Aug., 287

**FREER, J. L.** See **EARN, ALBERT A.**

**FREIBERG'S DISEASE.** See **Metatarsus**

**FREINKEL, NORBERT.** See **INGBAR, SIDNEY H.**

**FRICK, HENRY CLAY, II, CORSCADEN, JAMES A., JACOB, HAROLD W., and TAYLOR, HOWARD C., Jr.**: Surgical and radiologic treatment of cancer of the cervix in 97 cases (ab), Aug., 318

**FRIEDELL, HUMPHREY L.** See **MacINTYRE, WILLIAM J.**

—See **SALENRO, PAUL R.**

**FRIEDEMENBERG, Z. B., EDEIKEN, JACK, SPENCER, H. NEWTON, and TOLENTINO, S. C.**: Degenerative changes in the cervical spine (ab), Nov., 816

**FRIEDMAN, MILTON.**: Supervoltage (2-Mvp) rotation irradiation of cancer of the bladder, Aug., 191

—See **HODARA, MORRIS**

**FRIEDMAN, NATHAN B., and DRUTZ, EILEEN.**: The effects of chemotherapy and irradiation therapy on the differentiation of experimental tumors (ab), Oct., 668

**FRISI, THORKILD.**: Thyroxine metabolism in man estimated by means of I<sup>131</sup>-labelled L-thyroxine (ab), Sept., 489

**FRIPP, A. T.**: Vertebra plana (ab), July, 142

**FRISCHKORN, R.**: Danger of embolism with oily contrast media. A study of the problem of media in hysterosalpingography (ab), Dec., 953

**FRYE, THOMAS R.**: Villous adenoma of the sigmoid colon, July, 71

**FUJIMOTO, G. I.** See **Wiest, W. G.**

**FUJITA, T.** See **ALBERT, SOLOMON N.**

**FULLER, A. P., FOZZARD, J. A. F., and WRIGHT, G. H.**: Sphincteric action of crico-pharyngeus; radiographic demonstration (ab), Nov., 800

**FULLER, LILLIAN M.** See **MILLER, THEODORE R.**

**FUNCH, ROBERT B.** See **YOUNG, BARTON R.**

**FUNDERBURK, EUGENE E., Jr.** See **RODMAN, THEODORE DORE**

**FYLER, DONALD C., RUDOLPH, ABRAHAM M., WITTENBERG, MARTIN H., and NADAS, ALEXANDER S.**: Ventricular septal defect in infants and children; a correlation of clinical, physiologic, and autopsy data (ab), Sept., 468

G

**GACS, JANOS.** See **FOGEL, MARIA**

**GADEKAR, N. G.**: Radiological diagnosis of primary lung tumors (ab), Aug., 289

**GALANTE, MAURICE.** See **BUSCHKE, FRANZ**

**GALDINI, SALVATORE, and CIRLA, AUGUSTO.**: Clinical and roentgenologic considerations in forty-three cases of renal tumors (ab), Aug., 313

**GALE, N. H.** See **DOLPHIN, G. W.**

**GALLBLADDER**

- biliary vesicular stasis (ab), J. Dudfield Rose, Aug., 307
- changes in gallbladder after elective gastric surgery (ab), H. T. Cox et al., Aug., 306
- emptying of human gallbladder under stimulus of cholecystokinin (ab), Paul Edholm, Oct., 653
- calcification
- various calcification involving gallbladder (ab), Carlton M. Cornell and Robert Clarke, Dec., 948

**GALLBLADDER—cont.**

- calculi
  - opacifying gallstones (ab), Emanuel Salzman et al, Nov., 814
  - diseases
    - diagnostic value of intravenous cholangiography during acute cholecystitis and acute pancreatitis (ab), Henry C. Johnson, Jr. et al, Nov., 814
    - incidence of gallbladder disease in "normal" men (ab), Richard S. Wilbur and Robert J. Bolt, Dec., 948
    - radiographic signs of acute suppurative cholecystitis (ab), James J. McCort, Dec., 948
    - significance of preoperative cholangiography in management of gallbladder disease (ab), P. A. Ykelenstam, Sept., 476
  - diverticula
    - fatty meal in oral cholecystography: re-evaluation, with comments on "tumors" of gallbladder, and on its Rokitansky-Aschoff sinuses (ab), Christian V. Cimmino, Dec., 949
  - roentgenography. See also Bile Ducts, cysts; other sub-heads under Gallbladder
    - biliary tract roentgenography in lateral decubitus position (ab), John H. Walker, Oct., 653
    - Biligrahn and the nonvisualized gallbladder (ab), David Stenhouse, Aug., 306
    - fatty meal in oral cholecystography: re-evaluation with comments on "tumors" of gallbladder, and on its Rokitansky-Aschoff sinuses (ab), Christian V. Cimmino, Dec., 949
    - serial cholecystography: a means of preoperative diagnosis of biliary dyskinesia (ab), J. Dudfield Rose, Nov., 813
    - simultaneous cholecystography and urography with new medium "Duografin" (ab), Theodore L. Orloff, Aug., 315
  - GALLIUM, RADIOACTIVE.** See Radioactivity, radiogallium
  - GALLOWAY, RAYMOND W., and MILLER, RONALD S.** Lung changes in the recent influenza epidemic (ab), Nov., 802
  - GALLSTONES.** See Gallbladder, calculi
  - GAMMA GLOBULIN.** See Agammaglobulinemia
  - GAMMA RAYS.** See Radioactivity, radioactinium; Radioactivity, radionuclides; Radioactivity, radiostrontium
  - GARCIA, O.** See CASTELLANOS, A.
  - GARELLO, L.** See GHIRARDI, L.
  - GARTENLAUB, CHARLES.** See SAMMONS, BILLY P.
  - GAS**
    - See also Fetus, death of; Pancreas, abscess
    - meaning of gas bubble projected above level of diaphragm (ab), E. Koppenstein, Dec., 946
  - GASTRECTOMY.** See Peptic Ulcer, surgical therapy; Stomach, surgery
  - GASTRITIS.** See Stomach, inflammation
  - GASTROENTEROSTOMY.** See Stomach, surgery
  - GASTROINTESTINAL TRACT**
    - See also Colon; Intestines; Stomach; etc.
    - course in gastrointestinal radiology, University of Minnesota, Aug., 274
    - early gastrointestinal response in rat exposed to whole-body x-irradiation (ab), D. G. Baker and C. G. Hunter, Nov., 837
    - role of bile secretion in gastrointestinal radiation syndrome (ab), Kenneth L. Jackson and Cecil Entenman, Nov., 838
  - hemorrhage**
    - clinical diagnosis in gastrointestinal hemorrhage: a planned investigation including arteriographic studies of human stomach (ab), John K. Wagstaff, Nov., 810
    - motility
      - functional disturbances, Thomas E. Machella, Sept., 379
    - physiology
      - fat absorption from human gastrointestinal tract in patients undergoing radiation therapy, R. J. Reeves, A. P. Sanders, J. K. Isley, K. W. Sharpe and G. J. Bay, in, Sept., 398
      - modification of  $^{113}\text{I}$  triolein test of fat absorption utilizing a capsule test meal (ab), J. K. Isley, Jr., Sept., 489
    - roentgenography
      - barium meal and follow-through (ab), A. C. Glendinning, Sept., 473
      - Hypaque sodium powder: a new gastrointestinal opaque (ab), Wm. E. Allen, Jr., Nov., 813
      - right angle roentgenography of gastrointestinal tract (ab), Samuel L. Beranbaum and Harold G. Jacobson, Oct., 648
      - some radiologic observations on effect of morphine sulfate on gastrointestinal tract in man (ab), F. S. Grebbell, Aug., 300
    - tumors
      - malignant lymphomas of gastrointestinal tract (ab), Joe W. Frazer, Jr., Dec., 958
  - GASTROSCOPY.** See Stomach, cancer
  - GAY, BRIT, JR., WILKINS, SAM A., JR., and ENGELS, EDWARD P.** The roentgenologic characteristics of chondroma of the larynx (ab), Oct., 639
  - GEAN, DAVID A.** See HUTCHINSON, DONALD L.
  - GEBHARD, KATHARINE.** See CURTIS, H. J.
  - GEE, VERNON R.** See SCANLON, PAUL W.
  - GENE.** See Heredity

**GENERAL PRACTICE**

- possible disadvantages of a chest radiography service for general practitioners (ab), Peter Stradling and W. M. Dixon, Nov., 801
- GENGZOIAN, M.** See CONGDON, C. C.
- GEPHART, THOMAS.** See WANG, C. C.
- GERACE, J. R.** Mid-pelvis in pelvimetry (ab), Dec., 953
- GERARD, A.** See BONTE, G.
- GERARD, FRANKLYN P., and LYONS, HAROLD A.** Anomalous artery in intralobar bronchopulmonary sequestration. Report of two cases demonstrated by angiography (ab), Aug., 299
- GERBASI, F. S., MARGILETH, A. M., and KIBLER, R. S.** Primary fibrosarcoma of the lung in a young child. A case treated by lobectomy and cobalt therapy (ab), Dec., 957
- GERDES, JAMES C.** See KURNICK, N. B.
- GERMAN, WILLIAM J.** See FRANKEL, SAUL A.
- GEROTA'S FASCITIS.** See Fascitis
- GERSHON-COHEN, J.** See BERGER, SIMON M.
- See FORMAN, MYRON
- GERSON, ARNOLD.** See MARSHAK, RICHARD H.
- GERSTNER, HERBERT B.** Acute clinical effects of penetrating nuclear radiation (ab), Aug., 327
- GHIRARDI, L., GARELLO, L., and LERTORA, M.** Angiographic experiences in basilar skull projection (ab), Oct., 638
- GIBBS, JOHN E.** See KRIS, JOSEPH P.
- GILBRIN, E.** See LE MELLETIER, J.
- GILMORE, JOHN H.** See SOTEROPoulos, C.
- GILROY, JAMES A., and ADAMS, ANDREW B.** Extraskeletal infiltration in multiple myeloma, Sept., 406
- GIMES, B., and HORVATH, F.** Varicosity of the pulmonary vein (ab), Dec., 945
- GIMLETTE, T. M. D.** Constrictive pericarditis (ab), Nov., 806
- GIRDANY, BERTRAM R.** See SIEBER, WILLIAM K.
- GISH, JAMES R., COATES, E. O., DU SAULT, LUCILLE A., and DOUB, HOWARD P.** Pulmonary radiation reaction: vital-capacity and time-dose study, Nov., 679
- GLADNICKOFF, H.** Congenital atresia of the small intestine: a roentgenographic study of 24 cases (ab), July, 138
- GLASS.** See Foreign Bodies
- GLASS, GEORGE B. JERZY**: Deposition and storage of vitamin B<sub>12</sub> in the normal and diseased liver (ab), Dec., 961
- GLEADHILL, C. A.** See EDELSYN, G. A.
- GLENDINNING, A. C.** Barium meal and follow-through (ab), Sept., 473
- GLENN, JAMES F.** Thixokon cystourethrography (ab), Aug., 314
- GLEY, A.** See SKORYNA, STANLEY C.
- GLICKSMAN, ARVIN S., RAWSON, RULON W., and NICKSON, JAMES J.** Modification of late radiation injury with l-triiodothyronine, Aug., 178
- GLIEDMAN, MARVIN L.** See BURKLE, JOSEPH S.
- GLIOBLASTOMA.** See Brain, tumors
- GLOMERULONEPHRITIS.** See Nephritis
- GLOVER, D. M.** See CROSS, F. S.
- GOATCHER, PHYLLIS B. E.** The Nisbet symposium: collagen disease, Part 2: The arthritides (ab), Oct., 662
- GODDARD, DAVID W.** Experiences with Thixokon: the new urethographic medium (ab), Nov., 820
- GODFREY, JAMIE E.** See GREENFIELD, ROBERT E.
- GOITER**
  - See also Thyroid
  - iodine metabolism of endemic goiter on Aland Islands (Finland) (ab), B.-A. Lambreg et al, Sept., 490
- intrathoracic**
  - complete intrathoracic goiter simulating an aneurysm of ascending aorta; case (ab), John B. Codington and R. Adams Cowley, Aug., 292
- GOLD, RADIOACTIVE.** See Radioactivity, radiogold
- GOLDBERG, LEONARD M., and RITZMANN, LEONARD W.** Unusual manifestations in a case of relapsing, nodular, febrile panniculitis (Weber-Christian disease) (ab), Oct., 658
- GOLDENBERG, IRIS A.** See HAYES, MARK A.
- GOLDFISCHER, JEROME, and RUBIN, ELI H.** Dermatomyositis with pulmonary lesions (ab), Nov., 803
- GOLDMAN, LEON.** See WYLIE, EDWIN J.
- GOLDRING, DAVID, BEHRER, M., REMSEN, BROWN, GEORGE, and ELLIOTT, GLADDEN**: Rheumatic pneumonitis. Part II: Report on the clinical and laboratory findings in 23 patients (ab), Oct., 642
- GOLLAN, F.** See HAHN, F. F.
- GOLLMANN, G.** Hypertension in unilateral renal artery stenosis with arteriovenous fistula; arteriographic demonstration in an 18-year-old male (ab), July, 135
- GOLODETZ, ARNOLD.** See HAMOLSKY, MILTON W.
- See KURLAND, GEORGE S.
- GOMEZ, CRESPO, GODOFREDO.** See MACINTYRE, WILLIAM J.
- GNODAS**
  - gonadal dose in Canada arising from clinical use of unsealed radioactive isotopes (ab), H. E. Johns and R. M. Taylor, Oct., 667
  - radiation outside the defined field (ab), J. H. Martin and Ann Evans, Nov., 836

**GONADS—cont.**  
—reducing gonad irradiation in pediatric diagnosis (ab), Harry A. Bishop et al., Dec., 964

**GONSETTE, R.** See CORNÉLIS, G.

**GONZALEZ, E.** See CASTELLANOS, A.

**GONZALEZ-CERNA, JUAN L.**, and **LILLEHEI, C. WALTON**: Patent ductus arteriosus with pulmonary hypertension simulating ventricular septal defect: diagnostic criteria in ten surgically proven cases (ab), Sept., 468

**GOODWIN, PAUL N.**: Calorimetric measurements on a cesium-137 teletherapy unit (ab), Nov., 832

**GOOLDEN, A. W. G.**: Carcinoma of the thyroid following irradiation (ab), Aug., 325

—and **MALLARD, J. R.**: The use of iodine 132 in studies of thyroid function (ab), Sept., 488

**GORDON, LAWRENCE**: Paget's disease of the patella (ab), Oct., 658

**GORE, IRA, SMITH, JOHN**, and **CLANCY, ROBERT**: Congenital aneurysms of the coronary arteries with report of a case (ab), Dec., 943

**GORSON, ROBERT OWEN, LIEBERMAN, JESSE**, and **GREEN, MARVIN**: A limited survey of radiation exposure from medical fluoroscopes, Dec., 898

**GOWING, N. F. C.** See MILL, W. A.

**GRABSTAD, HARRY**. See HART, LOREN E.

**GRAF, EDWIN C.** See BAKER, WILLIAM J.

**GRAMIAK, RAYMOND**. See CAMPETI, FRANK L.

**GRANULOCYTES**  
—effect of x-rays on  $Fe^{55}$ -labeled granulocytes and lymphocytes of rabbit (ab), Luigi Resegotti, July, 160

**GRANULOMA**  
eosinophilic  
—roentgen therapy in Hand-Schüller-Christian and related diseases (ab), Bertel Jörgsholm, Sept., 487

**GRAS**. See LAUVAUR

**GRASSER, H.**: A roentgenkymographic sign of the gastrocardiac syndrome of Romheld (ab), Dec., 943

**GRAY, MARY JANE, GUSBERG, SAUL B.**, and **GUTTMANN, RUTH**: Pelvic lymph node dissection following radiotherapy (ab), July, 150

**GREBBELL, F. S.**: Some radiological observations on the effect of morphine sulphate on the gastro-intestinal tract in man (ab), Aug., 300

**GREENMAN, ROBERT B.** See **SAMMONS, BILLY P.**

**GREEN, CHARLES R.** See **MARUYAMA, YOSH**

**GREEN, HENRY**: A fluoroscopic sign of pulmonary stenosis (ab), Nov., 808

**GREEN, MARVIN**. See **GORSON, ROBERT OWEN**

**GREEN, RODNEY I.**: The radiological appearances of the soft palate with reference to the treatment of cleft palate (ab), Nov., 800

**GREENBERG, RICHARD**. See **RYAN, ALLAN J.**

**GREENDYKE, ROBERT M.** See **SCHREINER, BERNARD F.**

**GREENE, CLARENCE S.** See **BALKISSOON, BASDEO**

**GREENFIELD, M. A., FICHMAN, M.**, and **NORMAN, A.**: Dosage tables for linear radium sources filtered by 0.5 and 1.00 mm. of platinum, Sept., 418

**GREENFIELD, ROBERT E., GODFREY, JAMIE E.**, and **PRICE, VINCENT E.**: Studies on the anemia of tumor bearing animals. I. Distribution of radioiron following the injection of labeled erythrocytes (ab), Sept., 492

**GREENING, ROY R.**, and **LOVELIDGE, RALPH**: The adaptation of air chutes to roentgen diagnostic departments, Sept., 430

**GREENSPAN, RICHARD H.**, **LESTER, RICHARD G.**, **MARVIN, JAMES I.**, and **AMPLATZ, KURT**: Isotope circulation studies in congenital heart disease (ab), Dec., 961

Some clinical aspects of isotope circulation studies, Sept., 345

—See **THAL, ALAN P.**

**GREGG, D. McC.** See **BERRIDGE, F. R.**

**GRID THERAPY**. See **Cancer, radiotherapy; Roentgen rays; effects; Tumors, lymphoma**

**GRILL, W.** See **LOHR, H.**

**GRISWOLD, MATTHEW H.** See **RYAN, ALLAN J.**

**GROS, CH. M.**, and **KEILING, R.**: Aplasia of a breast after deep roentgen therapy for a mediastinal sarcoma (ab), Aug., 325

**GROSSBERGER, SAMUEL**. See **JACOBSON, HAROLD G.**

**GROSSMANN, MARIA E.** See **REISS, H. E.**

**GUDBERG, C. E.**, **HANSEN, L. KULD**, and **HASNER, E.**: Micturition cysto-urethrogram: automatic serial technique (ab), July, 147

**GUNZ, F. W.**, **BORTHWICK, R. A.**, and **ROLLESTON, G. L.**: Acute leukaemia in an infant following excessive intrauterine irradiation (ab), Sept., 495

**GURDJIAN, E. S.** See **WEBSTER, J. E.**

**GUSBERG, SAUL B.** See **GRAY, MARY JANE**

**GUTHIERIE, MARY J.**: Tumorigenesis in ovaries of mice after x irradiation (ab), Oct., 667

**GUTHRIE, W. JAMES**. See **BELL, A. L. LOOMIS, JR.**

**GUTTMACHER, ALAN F.** See **ROBERTS, LEONARD M.**

**GUTTMANN, RUTH J.**: Physical and clinical advantages and limitations of cobalt 60 teletherapy. Part II. Clinical considerations (ab), Nov., 832

—See **GRAY, MARY JANE**

**GYNECOGRAPHY**. See **Sterility**

**HAUSSLER, G.** See **FASSBENDER, C. W.**

**HAEX, A. J. CH.**, and **LIMBURG, D.**: Cholecystocholangiography with cholecystokinin (ab), Aug., 308

**HAFTER, ERNST**: Hiatal hernia: its diagnosis and clinical significance (ab), Oct., 654

**HAGELSTEN, H.** See **EEK, S.**

**HAGGART, G.**, **EDMUND, JOHNSTON, DAVID O.**, and **CREEDEN, FRANCIS**: Supervoltage radiation for sarcomata of the pelvis and lower extremities: a preliminary report (ab), July, 151

**HAHN, P. F.**, **LAREAU, D. G.**, **FEASTER, B. L.**, **CAROTHERS, E. L.**, **GOLLAN, F.**, **MENEELY, G. R.**, and **SHERMAN, D.**: Intravenous radioactive gold in the treatment of chronic leukemia. Comparison of results with conventional roentgen therapy to the splenic area (ab), Oct., 665

—and **MENG, H. C.**: Internal irradiation of dogs with radioactive colloidal gold: synergistic effect of iron (ab), Sept., 491

**HAINES, RICHARD D.** See **HIGHTOWER, NICHOLAS C. JR.**

**HALF-VALUE LAYER**. See **Roentgen Rays, physics**

**HALLERBACH, H.**, and **SCHAEDE, A.**: The diagnosis of complete transposition of pulmonary veins (ab), Aug., 296

**HALMAGYI, DENIS F. J.**: Dorsal kyphosis in chronic obstructive lung disease (ab), Dec., 951

**HALMAN, K. E.**, and **POCHIN, E. E.**: The use of iodine 132 for thyroid function test (ab), Sept., 488

**HALO SIGN**. See **Fetter, death of**

**HALONEN, PENTTI L.**, **SPYÖRALA, KALEVI**

**HAMMAN-RICH SYNDROME**. See **Lungs, fibrosis**

**HAMOLSKY, MILTON W.**, **GOLODETZ, ARNOLD**, and **FREEDBERG, A. STONE**: The plasma protein-thyroid hormone complex in man. III. Further studies on the use of the in vitro red blood cell uptake of  $I^{131}$ -tri-iodothyronine as a diagnostic test of thyroid function (ab), Nov., 829

—See **KURLAND, GEORGE S.**

**HANAFEE, WILLIAM N.**, and **TURNER, RODERICK D.**: Some uses of cineradiography in urologic diagnostic problems, Nov., 733

—See **STERN, W. EUGENE**

**HANCOCK, D. M.** See **PATERSON, D. E.**

**HAND** See also **Fingers and Toes**  
—retarding effect of protracted undernutrition on appearance of postnatal ossification centers in hand and wrist (ab), Samuel Dreizen et al., Oct., 655

**HAND, ALBERT M.** See **SMITH, HARRIS L.**

**HAND-SCHÜLLER-CHRISTIAN DISEASE**. See **Schüller-Christian Syndrome**

**HANKAMP, LAMAR J.**: Congenital choledochal cyst. Demonstration by oral cholecystography (ab), Nov., 814

**HANSEN, L. KULD**. See **GUDBERG, C. E.**

**HARDIN, CREIGHTON A.**, **WERDER, ALVAR A.**, **MC GUIRE, TOM H.**, and **WOODSON, DONALD R.**: Supportive therapy to animals exposed to whole body irradiation (ab), Aug., 328

**HARDING, H. E.**, **MC LAUGHLIN, A. I. G.**, and **DOIG, A. T.**: Clinical, radiographic, and pathological studies of the lungs of electric-arc and oxyacetylene welders (ab), Sept., 466

**HARDY, ROBERT C.** See **MUNSLAW, RALPH A.**

**HARINSUTA, CHAMLONG**. See **SUWANIK, ROMSAI**

**HARKINS, HENRY N.** See **JESSEPH, JOHN E.**

**HARPER, PAUL V.**, and **LATHROP, KATHERINE**: Implant radiation therapy for carcinoma of the pancreas (ab), Aug., 318

—**LATHROP, KATHERINE A.**, **BALDWIN, LOUIS ODA**, **YOSHIO, and KRYSHTALE, LIDIA**: Palladium  $103$ , a new isotope for interstitial implantation at operation (ab), Aug., 322

**HARRIS, PAYNE S.** See **BOONE, IRENE U.**

**HARRISON, HAROLD N.**: Ewing's sarcoma: ten-year survivals. Report of a case with recurrent pulmonary metastases (ab), Sept., 487

**HARRISS, EILEEN B.** See **BELCHER, E. H.**

**HARRON, BENEDICT R.**, and **SLOANE, JACK A.**: Anenrysma of renal artery: report of five cases (ab), Nov., 89

**HART, F. DUDLEY**: Ankylosing spondylitis (ab), Oct., 664

**HART, LOREN E.**, **SACHS, MAURICE D.**, and **GRABSTAD, HARRY**: Comparative study of urographic contrast media (ab), Aug., 313

**HARTWIG, O. L.**, **MELVILLE, G. S.**, Jr., and **LEFFINGWELL, T. P.**: Lethality in the rat as a function of dose pattern (ab), Oct., 668

**HASE, OTTHEINRICH, HOLADAY, DUNCAN A.**, and **DETERLING, RALPH A.**, Jr.: Studies in coronary arteriography. Systolic vs. diastolic appearance of the coronary arteries, Nov., 785

**HASNER, E.** See **GUDBERG, C. E.**

**HAUGE, TORMOD**: So-called spontaneous cervical dislocations. A clinical, roentgenological, surgical and post-mortem study of the pathogenesis and treatment in five cases (ab), Sept., 477

**HAUSMANN, PAUL F.**: Pulmonary aspergilloma (ab), Oct., 642

**HAWKINS, S. B.** See **SPALDING, J. F.**

**HAY, G. A.:** Quantitative aspects of television techniques in diagnostic radiology (ab), Sept., 483

**HAYDEN, H. S.** See CORRIGAN, K. E.

**HAYES, MARK A., GOLDENBERG, IRA S., and BISHOP, COURTNEY C.:** The developmental basis for bile duct anomalies (ab), Aug., 308

**HEAD**  
See also Brain; Cranium  
—radical preoperative roentgen therapy in primarily inoperable advanced cancers of head and neck, Franz Buschke and Maurice Galante, Dec., 845

**HEANEY, ROBERT P., and WHEDON, G. DONALD:** Radioisotope studies of bone formation rate in human metabolic bone disease (ab), Oct., 666

**HEART**  
See also Cardiovascular System; Pericardium  
—determination of cardiopulmonary circulation time by external scintillation counting (ab), Ismael Mena et al., Nov., 833  
—diagnosis of pericardial effusion with intracardiac carbon dioxide, James H. Sealiff, Alfred J. Kummer and Arnold H. Janzen, Dec., 871  
—inhalation radioangiography (using radioactive methyl iodide and radioiodine) (ab), C. H. Jaimes et al., Oct., 666  
—reaction of heart to selective angiography (ab), Russell A. McFall et al., Nov., 803

**abnormalities.** See also Cardiovascular System, abnormalities  
—angiographic features of Bland-White-Garland syndrome (ab), Erich K. Lang et al., Nov., 807  
—angiographic features of patent foramen ovale (ab), Louis A. Soloff and Jacob Zatuchni, July, 132  
—anomalous drainage of all pulmonary veins into left innominate vein with interauricular communication: so-called Tussig-Snellen-Albers syndrome (ab), I. Ferrario, Sept., 471  
—combined auricular and ventricular septal defects; study of 5 cases with postmortem confirmation in 3 (ab), J. Espino-Vela et al., Oct., 644  
—congenital absence of a main branch of pulmonary artery; report of 3 new cases associated respectively with bronchietasis, atrial septal defect, and Eisenmenger's complex (ab), Israel Steinberg, Aug., 293  
—congenital malformation of cardiac conduction system (ab), Arthur J. Moss et al., Nov., 804  
—cor triatriatum sinistrum (ab), C. H. (Joseph) Chang and James V. Rogers, Jr., Nov., 805  
—corrected transposition of great vessels of heart (ab), J. A. Kernen, Oct., 645  
—Eisenmenger syndrome or pulmonary hypertension with reversed central shunt (ab), Paul Wood, July, 131  
—evaluation of conventional roentgenologic methods in the study of congenital heart disease (ab), Charles W. Vickers and Owings W. Kincaid, Aug., 292  
—intravenous angiographies: analysis of 660 cases (ab), A. Castellanos et al., July, 136  
—isotope circulation studies in congenital heart disease (ab), Richard H. Greenspan et al., Dec., 961  
—late hemodynamic complications of anastomotic surgery for treatment of tetralogy of Fallot (ab), Richard S. Ross et al., Aug., 296  
—ostium primum syndrome (ab), Brian Kiely et al., July, 131  
—patent ductus arteriosus with pulmonary hypertension simulating ventricular septal defect: diagnostic criteria in 10 surgically proved cases (ab), Juan L. Gonzalez-Cerna and C. Walton Lillehei, Sept., 468  
—pulmonary hypertension in congenital heart disease (ab), William Evans and D. S. Shute, Aug., 293  
—radiological evaluation of isolated ventricular septal defects before and after surgical closure, Edward B. Singleton, Dan G. McNamara, Robert D. Leachman, Denton A. Couley and Paul M. Chau, July, 37  
—relationship of cardiac silhouette to altered respiratory dynamics in congenital heart disease in infants, Lawrence A. Davis and Margaret Vermillion, July, 49  
—rheumatic heart disease associated with atrial septal defect: clinical and pathological study of 12 cases of Lutembacher's syndrome (ab), J. Espino-Vela, Dec., 942  
—use of intravascular carbon dioxide gas to demonstrate interatrial septal defects (ab), William Winters et al., Nov., 804  
—ventricular septal defect in infants and children: correlation of clinical, physiologic, and autopsy data (ab), Donald C. Fyler et al., Sept., 468  
—wedge pulmonary arteriography: its application in congenital and acquired heart disease, A. L. Loomis Bell, Jr., Seiichi Shimomura, W. James Guthrie, Herbert F. Hempel, Hugh F. Fitzpatrick and Charles F. Begg, Oct., 566

**beat**  
—condition of pulmonary vessels in bronchial carcinoma: an electrokymographic investigation (ab), J. Lissner, Dec., 939  
—studies in coronary arteriography: systolic vs. diastolic appearance of coronary arteries, Otto Heinrich Hase, Duncan A. Holaday and Ralph A. Deterling, Jr., Nov., 785

**calcification.** See also Mitral Valve  
—significance of calcification of wall of left atrium; 2 cases, Paul S. Mahoney and Bernard J. O'Loughlin, Sept., 402

**catheterization**  
—examination of thoracic aorta and left ventricle by intraventricular catheterization via femoral artery (ab), G. Bonte et al., Aug., 298  
—perforation of heart during cardiac catheterization and selective angiography (ab), Doris J. W. Escher et al., July, 136  
—right heart catheterization in infants and children: analysis of data obtained in study of 218 patients (ab), Burton W. Fink et al., Oct., 644

**cysts.** See Heart, echinococcosis

**diseases.** See also Heart, abnormalities  
—arteriographic studies of coronary arteries in ischemic heart disease (ab), Alan P. Thal et al., Oct., 646  
—beriberi heart disease (ab), Reverdy H. Jones, Jr., Dec., 943  
—physiological studies on beriberi heart disease by injection of radioactive material (ab), R. Lessard et al., Nov., 834  
—wedge pulmonary arteriography: its application in congenital and acquired heart disease, A. L. Loomis Bell, Jr., Seiichi Shimomura, W. James Guthrie, Herbert F. Hempel, Hugh F. Fitzpatrick and Charles F. Begg, Oct., 566

**displacements**  
—cardiac dextroposition: hypoplasia of right pulmonary artery with right venous pulmonary drainage into the inferior vena cava (ab), M. Torner-Soler et al., July, 132

**echinococcosis**  
—value of angiography in diagnosis of hydatid cysts of heart (ab), Lavaurus and Gras, Oct., 645

**hypertrophy**  
—postoperative myxedema cardiopathy: an unusual instance which developed in immediate postoperative period; case report and review of literature (ab), F. G. Hoffman, Dec., 943

**infarction**  
—a new kymographic sign of myocardial infarct: dissociation of kymographic layers (ab), Ismet Sayman, Nov., 805

**inflammation**  
—radiological observations on 33 cases of primary interstitial myocarditis during an outbreak in Haifa area (ab), J. Murk and K. T. Lederer, Aug., 297

**perforation.** See Heart, catheterization

**rate**  
—thyroid function in supraventricular tachycardias: turnover of intravenously infused  $I^{131}$ -labeled thyroxine and the red blood cell uptake of  $I^{131}$ -labeled  $I$ -triiodothyronine (ab), George S. Kurland et al., Nov., 829

**roentgenography.** See also other subheads under Heart  
—importance of lateral view in evaluation of left ventricular enlargement in rheumatic heart disease, William R. Elyer, David L. Wayne and John E. Rhodenbaugh, July, 56  
—roentgen kymographic sign of gastrocardiac syndrome of Römhild (ab), H. Grasser, Dec., 943

**size**  
—angiographic observations in mitral disease with special reference to volume variations in left atrium (ab), Håkan Arvidsson, Aug., 296  
—use of biplane cineradiography for measurement of ventricular volume (ab), Carleton B. Chapman et al., Oct., 645

**valves.** See Aortic Valve; Mitral Valve; Pulmonary Valve

**HEIKEL, PER-ERIK.** See PYÖRÄLÄ, KALEVI

**HELDER, M., WAHLBERG, T., FORSSBERG, A., SWEDIN, B., CLEMEDSON, C. J., and NELSON, A.:** Radiation dose measurements and leucocyte count in rabbits (ab), Sept., 498

**HELLMAN, LOUIS P.** See CHACE, JOHN F.

**HELLRIGEL, WERNER:** Advantage of aimed pendulum roentgen therapy of esophageal carcinoma (ab), Dec., 955

**HELLSTRÖM, GUNNAR.** See LAMBERG, B.-A.

**HEMANGIOMA.** See Tumors, angioma

**HEMATOMA.** See Duodenum, hematoma

**HEMATOPORPHYRIN**  
—attempts at modification of radiation response of neoplasms by administration of hematoporphyrin (ab), Robert Bases et al., Oct., 668

**HEMATURIA**  
—pyelographic diagnosis of lesions of renal papillae and calyces in cases of hematuria (ab), Benjamin S. Abeshouse and Julian O. Salik, Sept., 481

**HEMIPARESIS.** See Hemiplegia

**HEMIPLEGIA**  
—ipsilateral carotid thrombosis in hemiparesis (ab), E. Stricker and M. Klingler, Sept., 465  
—observations on hemiplegia with middle cerebral artery trunk occlusions and with "normal" carotid angiograms (ab), J. E. Webster and E. S. Gurdjian, July, 128

**HEMOGLLOBIN**  
—hemoglobin SC disease (ab), W. P. Cockshott, Aug., 309

## HEMOPOIETIC SYSTEM

See also Bones, marrow; Leukemia; Spleen  
 —hematologic findings in human beings given therapeutic doses of gallium 72 (ab), W. Wolins and V. P. Bond, Aug., 322  
 —immunogenetic studies on x-irradiated mice treated with homologous hematopoietic cells (ab), Michael Feldman and David Yaffe, Sept., 500  
 —irradiation of entire body and marrow transplantation: some observations and comments (ab), E. Donnell Thomas et al, Dec., 963  
 —treatment of postirradiation hematopoietic depression in man by the infusion of stored autogenous bone marrow; preliminary observations (ab), N. B. Kurnick et al, Sept., 497

**HEMORRHAGE.** See Aneurysm, cerebral; Gastrointestinal Tract, hemorrhage; Meninges, hemorrhage

**HEMPEL, HERBERT F.** See BELL, A. L. LOOMIS, JR.

**HENSLER, L.** See ZOLLINGER, H. U.

## HEREDITY

See also Familial Conditions  
 —effect of dose rate on genetic damage from fast electrons in Drosophila sperm (ab), Armon F. Yanders, Nov., 838

## HERNIA

## diaphragmatic

—hiatal hernia: its diagnosis and clinical significance (ab), Ernst Hafer, Oct., 654  
 —incarceration of stomach and intestine after traumatic rupture of diaphragm (ab), F. Kümmel, Sept., 474  
 —use of prone-pressure device for visualizing hiatus hernia (ab), Richard H. Marshak and Arnold Gerson, Oct., 654

**HERRNEISER, G.**: Concerning the roentgen diagnosis of pulmonary edema (ab), Aug., 290

**HESS, PAUL**: Environmental influences on healing of cervical carcinoma (ab), July, 150

**HIBMA, OTTO V., and BOLDON, EDWARD I.**: Surgical experiences with pulmonary coin lesions (ab), Sept., 467

**HIGAZI, A. M.** See ABDEL-HAKIM, M.

**HIGHTOWER, NICHOLAS C., Jr., BRÖDERS, A. COMPTON, Jr., HAINES, RICHARD D., MCKENNEY, JOHN F., and SOMMER, ARNO W.**: Chronic ulcerative colitis. I. Diagnostic considerations (ab), Aug., 305

**HILBISH, THEODORE F., and BLACK, ROGER L.**: X-ray manifestations of peptic ulceration during corticosteroid therapy of rheumatoid arthritis (ab), Aug., 303

**HILL, IAN**. See WATSON, HAMISH

**HINDERLING, W.** See UEBELHART, R.

**HINDMARSH, MARGARET, OWEN, MAUREEN, VAUGHAN, JANET, LAMERTON, L. F., and SPIERS, F. W.**: The relative hazards of strontium 90 and radium 226 (ab), Aug., 223

**HINE, GERALD J.** See HODARA, MORRIS

**HINMAN, FRANK, Jr., and OPPENHEIMER, RUDOLF**: Functional characteristics of the ileal segment as a valve (ab), Nov., 820

## HIP

See also Femur

## disease

—circulatory disturbances in osteoarthritis of hip: a roentgenographic study (ab), Anders Hult, Nov., 817

## roentgenography

—hip arthrography in children, with Renografin, James C. Barnett and Joseph P. Arcamano, Aug., 245  
 —simple device for obtaining lateral acetabular views of hip in infants, Donald B. Darling, Sept., 432

**HIRSCH, CARL**: The clinical evaluation of sciatica (ab), Sept., 478

## HISTOPLASMOSIS

—chronic fibrous mediastinitis due to *Histoplasma capsulatum* (histoplasmal mediastinitis); report of 3 cases with different presenting symptoms, George F. Lull, Jr., and Dean F. Winn, Jr., Sept., 367

—inflammatory pseudoproliferosis of small and large intestines with Peutz-Jeghers syndrome in case of diffuse histoplasmosis (ab), Solomon R. Bersack et al, July, 139

—some less familiar roentgen manifestations of intrathoracic histoplasmosis (ab), Benjamin Felson, Nov., 802

**HJORTH, POVL**. See AMDRUP, E.

**HODARA, MORRIS, FRIEDMAN, MILTON, and HINE, GERALD J.**: Radiation dosimetry with fluoroids (miniature glass rod dosimetry), Nov., 693

**HODGE, K. E.**: Pelvic angiography—with particular reference to its value in intrauterine pregnancy after the fifth month of gestation (ab), Sept., 480

**HODGES, PAUL C., and MOSELEY, ROBERT D., Jr.**: Cinéfluorography employing split-image television type image amplifiers, Oct., 548

**HOOK, OLLE**: Subarachnoid hemorrhage. Prognosis when angiography reveals no aneurysm. A report of 138 cases (ab), Sept., 463

**HOFFMAN, F. G.**: Postoperative myxedema cardiopathy: an unusual instance which developed in the immediate postoperative period. Case report and review of literature (ab), Dec., 943

**HOHL, K.**: Wear and tear on the spine. A contribution to the reduction of radiation to the patient (ab), Oct., 670

**HOLADAY, DUNCAN A.** See HASE, OTTHEINRICH

**HOLDER, DAVID L.** See SPRUNT, WILLIAM H.

**HOLLICROFT, JOANNE W., and SMITH, WILLIE W.**: Endotoxin treatment and x irradiation in mice bearing transplanted tumors (ab), July, 159

**HOLLEB, ARTHUR I.** See TREVES, NORMAN

**HOLLINGSWORTH, J. W.**: Compatibility factors influencing the acceptance of rat bone marrow graft by the irradiated mouse (ab), Oct., 668

**HOLM, OLOF FR.**: Denel's halo sign (ab), Aug., 312

**HOLMAN, CRANSTON W., and STEINBERG, ISRAEL**: The role of angiography in the surgical treatment of massive pericardial effusions (ab), Sept., 469

**HOLMAN, W. F.**: The treatment of disease of the thyroid by irradiation (ab), Dec., 960

**HOLMES, GEORGE WINSLOW** (obit), July, 112

**HOLT, A. H.** See MARQUARDT, C. R.

**HOLTZ, S., and POWERS, W. E.**: Calcification in papillary carcinoma of the thyroid (ab), Oct., 639

**HORMONES**. See Cholecytokinin; Thyroid, hormone

**HORVATH, F.** See GIMES, B.

**HOSICK, THOMAS A.** See MESCHAN, I.

**HOU-HIO-HI**. See CORNÉLIS, G.

**HOWARD, WILLIAM H. R.** See KNOBLOCH, HILDA

**HOWJOH, JOHN S.** See BERSACK, SOLOMON R.

**HOWLAND, JOE W.** See JOHNSTONE, DOUGLAS E.

—See SHIVELY, JAMES N.

**HOWORTH, BECKETT**: Coxa plana (ab), Nov., 818

**HUFFMAN, WILLIAM L.** See FORSYTHE, WILLIAM E.

**HUGHES, DIXON**. See ZHEUTLIN, NORMAN

**HULSE, E. V.** See CROOK, J. C.

**HULTH, ANDERS**: Circulatory disturbances in osteoarthritis of the hip. A venographic study (ab), Nov., 817

Femoral-head phlebography: a method of predicting viability (ab), July, 146

The vessel anatomy of the upper femur end with special regard to the mechanism of origin of different vascular disorders (ab), Sept., 479

## HUMERUS

—non-union of epiphysis of lateral condyle of humerus (ab), C. C. Jeffery, July, 145

**HUNTER, C. G.** See BAKER, D. G.

**HUNTER, CHARLES H.** See ALBERT, SOLOMON N.

**HUNTER, DENISE A.** See MOLLISON, P. L.

**HURWITZ, ELLIOTT S.** See ESCHER, DORIS J. W.

**HUSEBYE, KJELD O.** See BRAILEY, ALLEN G., JR.

**HUTCH, JOHN A., ATKINSON, RAY C., and LOQUVAM, GEORGE S.**: Perirenal (Gerota's) fascitis (ab), Nov., 819

**HUTCHINSON, DONALD L., BENNETT, LESLIE R., and GEAN, DAVID A.**: Isotope localization of the placenta in placenta previa (ab), July, 153

**HUTTON, C. F.** See COOKE, LORNA

—See PYGOTT, F.

**HYDATID CYSTS**. See Brain, echinococcosis; Heart, echinococcosis

**HYDE, LEROY**. See PAYSEUR, COYT R.

**HYDROCEPHALUS**. —local bulging of skull and external hydrocephalus due to cerebral agenesis (ab), R. G. Robinson, Oct., 638

**HYDROPS FETALIS**. See Erythroblastosis, Fetal

**HYMAN, G. A.** See REESE, A. B.

## HYOID

—calcification of hyoid, thyroid and tracheal cartilages in infancy: case (ab), P. E. Russo and C. G. Coin, July, 130

**HYPOAQUE**. See Brain, blood supply; Gastrointestinal Tract, roentgenography

**HYPERTENSION**. See Blood Pressure, high; Lungs, blood supply

**HYPERTHYROIDISM**. See Thyroid, hyperthyroidism

**HYPOPHYSECTOMY**. See Pituitary Body

**HYPOPHYYSIS**. See Pituitary Body

## HYPOSPADIAS

—should intravenous pyelography be a routine procedure for children with cryptorchism or hypospadias? (ab), Lester M. Felton, Dec., 954

**HYPOTHYROIDISM**. See Thyroid, hypothyroidism

**HYPOXIA**. See Oxygen

**HYSTEROGRAPHY**. See Uterus, cysts; Uterus, roentgenography

**HYSTÉROSALPINGOGRAPHY**. See Fallopian Tubes, roentgenography

## I

**IANNACCONE, G.** See CIARPAGLINI, L.

**IGLAUER, EDUARD**. See ERNST, HELMUT

**IKEYA, JUNKO**. See VANTRAPPEN, GASTON

**ILBERY, PETER**: Lethal whole body irradiation: some experimental issues (ab), Oct., 667

## ILEOCECAL VALVE

—diagnostic implications of ileocecal valve (ab), Stanley Stark, Sept., 473

## ILEUM

See also Intestines

—functional characteristics of ileal segment as a valve (ab), Frank Hinman, Jr., and Rudolf Oppenheimer, Nov., 820

—interposition of loop of ileum between dome of diaphragm and liver (ab), M. G. Varadarajan, Dec., 947

LLIE W.  
ce bearings influen-  
ct by theISRAEL:  
treatment  
the thyroidpapillary  
neLDA  
S E.

IAM E.

coarthri-  
812

ting via-

a special

vascular

humerus

N.

7.

r. UVAM,  
Nov. 89  
R., and  
he pla-

Heart,

due to

ages in

July,

estinal

blood

cEDURE

(ab),

ntgen-

Tubes,

some

Stanley

valve

imer,

fragm

**ILIUM**

—iliac apophysis and evolution of curves in scoliosis (ab), Alexander L. Zaoussi and J. I. P. James, July, 144

**ILYINA, L. I.** See **KLEMPARSKAYA, N. N.****IMAGE INTENSIFICATION.** See **Cineroentgenography; Roentgen Rays, fluoroscopy****IMMUNITY**

—immunogenetic studies on x-irradiated mice treated with homologous hematopoietic cells (ab), Michael Feldman and David Yaffe, Sept., 500

**INCH, W. R.** See **BULLEN, M. A.****INDEX**

—Cumulative Index IV (ed), Oct., 620

**INDUSTRY AND OCCUPATIONS**—diseases and poisoning. See also **Pneumoconiosis; Radiations, protection against**

—chronic pulmonary insufficiency secondary to silo-filler's disease (ab), Gilbert M. P. Leib et al, Aug., 290

—clinical, radiographic, and pathological studies of lungs of electric-arc and oxyacetylene welders (ab), H. E. Harding et al, Sept., 466

**INFANTS. See Children****INFANTS, NEWBORN**

—perforation of stomach in the newborn (ab), Richard B. Magen and R. Marvel Keagy, Sept., 474

—rupture of spleen in newborn infants: recovery after splenectomy (ab), William K. Sieber and Bertram R. Gindran, Sept., 476

**INFARCTION. See Bones, infarction; Heart, infarction****INFERTILITY. See Sterility****INFLUENZA**

—lung changes in recent influenza epidemic (ab), Raymond W. Galloway and Ronald S. Miller, Nov., 892

**INGBAR, SIDNEY H., and FREINKEL, NORBERT:** Thyroid function and the metabolism of iodine in patients with subacute thyroiditis (ab), Aug., 323**INGLEBY, HELEN.** See **BERGER, SIMON M.****INTELLIGENCE**

—relationship between findings in pneumoencephalograms and clinical behavior (ab), Hilda Knobloch et al, Sept., 463

**INTERNATIONAL CONGRESS OF PHOTOBIOLOGY**

(Third), Oct., 621

**INTERNATIONAL CONGRESS OF RADIOLOGY (ninth)**

—report of meeting (ed), Nov., 787

**INTESTINES**See also **Colon; Gastrointestinal Tract**

—effect of total-body x-radiation from near-threshold to tissue-lethal doses on small-bowel epithelium of rat. I. Changes in morphology and rate of cell division in relation to time and dose (ab), R. Bland Williams et al, July, 156

—effect of total-body x-radiation from near-threshold to tissue-lethal doses on small-bowel epithelium of the rat. II. Changes in nucleic acid and protein synthesis in relation to cell division (ab), Jane N. Toal et al, July, 157

—ultraviolet microscopy of x-irradiated intestine (ab), Yevette S. Lewis et al, Sept., 496

**abnormalities**

—congenital atresia of small intestine: roentgenographic study of 24 cases (ab), H. Gladnikoff, July, 138

—malrotation of midgut in infancy and childhood (ab), William B. Kiesewetter and John W. Smith, Aug., 305

**atresia.** See **Intestines, abnormalities****blood supply**

—new concept of small intestine vascular pattern (ab), Alan B. Becker and H. B. Benjamin, Dec., 947

—vascular study of small intestine (ab), H. B. Benjamin and A. B. Becker, Dec., 947

**diseases**

—inflammatory pseudoproliferosis of small and large intestines with Peutz-Jeghers syndrome in case of diffuse histoplasmosis (ab), Solomon R. Bersack et al, July, 139

—regional enteritis. I. Clinical aspects and diagnosis in 100 patients (ab), John E. Daffner and Charles H. Brown, July, 140

**diverticula**

—jejunal and ileal diverticulosis (ab), Robert E. Lee and Nathaniel Finby, Aug., 304

—remarks on clinical and radiologic diagnosis of Meckel's diverticulum: case (ab), Morris C. Miller, Aug., 306

**hematoma.** See **Intestines, obstruction**

—acute obstruction of small intestine secondary to hematoma in children (ab), A. L. Mestel et al, Nov., 812

—incarceration of stomach and intestine after traumatic rupture of diaphragm (ab), F. Kummerle, Sept., 474

**physiology**—cystic fibrosis of pancreas: intestinal absorption of fat and fatty acid labeled with  $I^{131}$  (ab), Keith Reentsma et al, Oct., 652—study of fat absorption utilizing  $I^{131}$ -labeled corn oil in infants and children with and without steatorrhea (ab), Samuel Spector et al, Oct., 665**roentgenography.** See also **Colon, roentgenography; Gastrointestinal Tract, roentgenography; other subheads under Intestines**

—fatal venous intravasation of barium during a barium enema, Lee S. Rosenberg and Archie Fine, Nov., 771

**INDEX**

—radiological demonstration of variations in fluid content of small intestine during dumping attacks (ab), E. Amstrup et al, Aug., 304

—radiological investigation of small intestine in tropical idiopathic malabsorption (ab), D. E. Paterson and S. J. Baker, Aug., 303

—use of barium tannic acid enema in investigation of large intestine (ab), A. K. Bhattacharyya and D. E. Paterson, Aug., 306

**surgery**

—intestinal hypertrophy following partial resection of small bowel in rat (ab), C. C. Booth et al, Nov., 812

**tumors**

—inflammatory pseudoproliferosis of small and large intestines with Peutz-Jeghers syndrome in case of diffuse histoplasmosis (ab), Solomon R. Bersack et al, July, 139

—lymphosarcoma of small intestine in infancy and childhood (ab), A. L. Mestel, Nov., 812

**INTUSSUSCEPTION**

—in infancy and childhood; analysis of 77 cases treated by barium enema (ab), Mark M. Ravitch, Sept., 474

—jejunogastric intussusception, C. Soteropoulos, Y. Berkmen and John H. Gilmore, Aug., 238

—radiological considerations in diagnosis and treatment of intussusception (ab), Edward B. Singleton, Nov., 812

—roentgen diagnosis of retrograde jejunogastric intussusception, Lester W. Paul and Charles Benkendorf, Aug., 234

**IODINE AND IODINE COMPOUNDS**See also **Brain, roentgenography; Spine, intervertebral disks; etc.**—effect of oral Lipiodol on thyroidal  $I^{131}$  uptake and serum protein-bound iodine concentration (ab), Anne C. Carter et al, Dec., 960**metabolism**

—iodine metabolism of endemic goiter on Aland Islands (Finland) (ab), B. A. Lambreg et al, Sept., 490

—thyroid function and metabolism of iodine in patients with subacute thyroiditis (ab), Sidney H. Ingbar and Norbert Freinkel, Aug., 323

**radioactive.** See **Radioactivity, radioiodine; Thyroid****IODOHYDROXYRINE** See **Thyronine****IONIZATION CHAMBERS**

—design of free-air ionization chambers for the soft x-ray region (20-100 kv), Victor H. Ritz, Dec., 911

**IRON**

—internal irradiation of dogs with radioactive colloidal gold: synergistic effect of iron (ab), P. F. Hahn and H. C. Meng, Sept., 491

**radioactive.** See **Radioactivity, radioiron****IRONSIDE, WILLIAM M. S., CARPENTER, JAMES W. J., ROEDAL, ROBERT, and LINDSAY, JOHN R.:** Carcinoma of the larynx. Results obtained by surgery and external radiation in 93 cases (ab), Dec., 956**ISLEY, J. K., JR., SANDERS, A. P., BAYLIN, G. J., RUFFIN, J. M., SHINGLETON, W. W., ANYAN, W. G., and SHARPE, K. W.:** A modification of the  $I^{131}$  triolein test of fat absorption utilizing a capsule test meal (ab), Sept., 489—See **REEVES, R. J.****SAUNDERS, A. P., SHARPE, K. W., REEVES, R. J., and B. YILIN, G. J.:** The use of radioactive isotopes in the study of colonic absorption (ab), Dec., 961**ISOL-131 CHARTS.** See **Radiotherapy****ISOTOPES.** See **Radioactivity****ISRAEL**

—radiological observations on 33 cases of primary interstitial myocarditis during an outbreak in Haifa area (ab), J. Munk and K. T. Lederer, Aug., 297

**IZENSTARK, J. L.** See **BLEDSOE, R. C.****J****JACKSON, HARVEY, RICHMOND, J. JACKSON, and SIMPSON, S. LEONARD:** Discussion on pituitary tumours (ab), Sept., 484**JACKSON, KENNETH L., and ENTENMAN, CECIL:** The role of bile secretion in the gastrointestinal radiation syndrome (ab), Nov., 838**JACKSON, W. P. U.:** Osteoporosis of unknown cause in younger people: idiopathic osteoporosis (ab), July, 142**JACOBS, JULIAN E.:** Observations of neuropathic (Charcot) joints occurring in diabetes mellitus (ab), Aug., 310**JACOBSEN, ELLY M., DAVIS, A. K., and ALPEN, EDWARD L.:** Effect of fractionation of beta irradiation on rat skin (ab), July, 157**JACOBSON, BERTIL:** Automatic dodging of x-ray exposures to reduce the dose and increase the information (ab), Sept., 496**JACOBSON, GEORGE.** See **RYEL, JAMES W.****JACOBSON, HAROLD G., POPPEL, MAXWELL H., SHAPIRO, JEROME H., and GROSSBERGER, SAMUEL:** The vertebral pedicle sign: a roentgen finding to differentiate metastatic carcinoma from multiple myeloma (ab), Sept., 477—See **ROWLAND, L. P.****RUBINSTEIN, BERTA M., and ESCHER, DORIS J. W.:** Opacification of an atelectatic lung segment during selective angiography, July, 95—See **BERANBAUM, SAMUEL L.**

JACOX, HAROLD W. See FRICK, HENRY CLAY, II

JAIMET, C. H., TOMLINSON, R. H., and NACE, P. F.: Inhalation radiocardiography (ab), Oct., 666

JAMES, J. I. P. See ZAUSSIS, ALEXANDER L.

JANZEN, ARTHOLD H. See SCALIFF, JAMES H.

JAY, MARICE. See RUGGIERO, G.

JEFFERIES, WILLIAM MCK., LEVY, RICHARD P., and STORAASLI, JOHN P.: Use of the TSH test in the diagnosis of thyroid disorders, Sept., 341

JEFFERY, C. C.: Non-union of the epiphysis of the lateral condyle of the humerus (ab), July, 145

JEJUNUM  
See also Intestines; Intussusception  
—primary carcinoma of jejunum (ab), Chester Cassel and Harold M. Unger, July, 139

JELLINEK, STEFAN: Immediate effects of irradiation of elastic tissues with x-rays, radium, and radioactive cobalt (ab), Sept., 498

JENNETH, W. BRYAN, and WATSON, JAMES A.: The radio-opacity of glass foreign bodies, with report of a case of injury of the cauda equina by fragments of glass (ab), Sept., 478

JEPSON, R. P. See WILSON, G. M.

JESSEPH, JOHN E., JONES, THOMAS W., SAUVAGE, LESTER R., KANAR, EDMUND A., NYHUS, LLOYD M., and HARKINS, HENRY N.: Five year observations on unsupported fresh venous grafts of the aorta to dogs (ab), Sept., 470

JÖNSSON, GÖSTA, MÄNSSON, BROR, and RÖHL, LARS: Tantalum 182 in the treatment of bladder tumours (ab), Sept., 492

JØRGENSEN, J. BALSLEV. See AMDRUP, E.

JØRGSHOLM, BERTEL: Roentgen therapy in Hand-Schüller-Christian and related diseases (ab), Sept., 487

JOHNS, H. E., and CUNNINGHAM, J. R.: A precision cobalt 60 unit for fixed field and rotation therapy (ab), Nov., 832

—See CORMACK, D. V.

—and TAYLOR, R. M.: Gonadal dose in Canada arising from the clinical use of unsealed radioactive isotopes (ab), Oct., 667

JOHNSON, ADRIAN: Practical radiation protection (ab), Nov., 836

JOHNSON, DONALD W. See USON, AURELIO C.

JOHNSON, HENRY C., Jr., MINOR, B., DONALD, THOMPSON, JACK A., and WEENS, H. STEPHEN: Diagnostic value of intravenous cholangiography during acute cholecystitis and acute pancreatitis (ab), Nov., 814

JOHNSON, JOHN B. See BALKISSON, BASDEO

JOHNSON, PHILIP C., WEST, KELLY M., and RUTLEDGE, BOB J.: Destruction of the hypophysis with radioactive colloidal chronic phosphate in cancer of the prostate (ab), July, 152

JOHNSTON, DAVID O. See HAGGART, G. EDMUND

JOHNSTON, J. HARVEY, Jr. See SHANDS, W. C.

JOHNSTONE, ALAN S.: Observations on the radiologic anatomy of the oesophagogastric junction, Oct., 501

JOHNSTONE, DOUGLAS E., and HOWLAND, JOE W.: A comparison of the effects on the Schwartzman phenomenon of leukopenia produced by nitrogen mustard and by whole body irradiation (ab), Aug., 328

JOINTS  
See also Arthritis, Rheumatoid; under names of joints, as Ankle; Hip  
—generalized primary calcification of surface of articular cartilage, with demonstration of true joint space (ab), H. Muhr, July, 144  
—periaricular soft-tissue changes as a late consequence of burns (ab), Jaromir Kolář and Radko Vrabec, Nov., 815  
neuropathic (Charcot). See Ankle

JONES, J. WILLIAM (obit), Nov., 792

JONES, MALCOLM D. See SHELTON, GLENN E.

JONES, P. R. M., and DEAN, R. F. A.: The effects of kwashiorkor on the development of the bones of the knee (ab), Dec., 952

JONES, REVERDY H., Jr.: Beriberi heart disease (ab), Dec., 943

JONES, THOMAS W. See JESSEPH, JOHN E.

JÖNSSON, L. See HELANDER, C. G.

JORDAN, D. L. See RAMBACH, W. A.

JUDD, DONALD R. See MOORE, THOMAS C.

**K**

KÄRCHER, KARL-HEINZ: The treatment and care of the irradiated skin (ab), Sept., 495

KALBACH, HARVEY. See KREBS, JOHN S.

KALLMAN, ROBERT F., STEELE, RODERIC E., WEISSBLUTH, MITCHEL, and BAGSHAW, MALCOLM A.: The relative biological effectiveness of 4-Mev and 200-kvp x-rays, determined by the LD<sub>50</sub> of the 4-day-old chick embryo (ab), July, 158

KAMATA, RIKISABURO. See SAKKA, MASATOSHI

KAMEYAMA, YOSHIO. See MURAKAMI, UJIHIRO

KANAR, EDMUND A. See JESSEPH, JOHN E.

KANENSON, WILLIAM. See MELTZER, LAWRENCE E.

KAPLAN, GUSTAVE. See RUBENFELD, SIDNEY

KARMANOVA, Z. YA. See POPOV, S. N.

KARNELL, JOHAN. See BRODÉN, BROR

KATZ, ISADORE, and WAGNER, STEPHEN: Unilateral pulmonary "hypoxema," Sept., 362

KATZENSTEIN, ROLF. See RYAN, ALLAN J.

KAUFMAN, S. A., and LEVENE, GEORGE: Esophageal mucositis; report of a case with roentgenographic findings (ab), July, 138

KAWANO, MASASHICHI, SAHEKI, SOROKU, and MURATA, YUZABURO: A large pseudoaneurysm caused by extrapleural plastic ball phlebomegaly (ab), Aug., 291

KAY, JEROME HAROLD, ANDERSON, ROBERT M., MEHAUS, JOHN E., and LEWIS, REUBEN: High pressure patent ductus arteriosus. A report of three cases (ab), Dec., 943

KEAGY, R. MARVEL. See MAGEE, RICHARD B.

KEATES, P. G. See PYRAH, L. N.

KEET, A. D., Jr.: The prepyloric contractions in certain abnormal conditions (ab), Sept., 473

KIELING, R. See GROS, CH. M.

KELLEY, JOHN P. See TROUT, E. DALE

KEMP, F. H., and NICHOLS, A. F.: Focal spot sizes (ab), July, 148

—See ARDRAN, G. M.

KENIN, ABEL. See LEVINE, JACK

KENNEDY, WILLIAM M., and FISH, ROBERT G.: Acute granulocytic leukemia after radioactive-iodine therapy for hyperthyroidism (ab), Nov., 830

KENT, BARTIS M. See PETERSON, RICHARD E.

KEOGH, JOHN. See RYAN, ALLAN J.

KEOGH, RICHARD K., and FRASER, ROBERT G.: Experiences with a new contact laxative in the preparation of the colon for radiological examination (ab), Oct., 650

KERLEY'S LINES. See Mitral Valve

KERNEN, J. A.: Corrected transposition of the great vessels of the heart (ab), Oct., 645

KERNOHAN, JAMES W. See MacCARTY, COLLIN S.

KERR, D. F. See COX, H. T.

KEY, J. ALBERT, and FORD, LEE T.: A study of experimental trauma to the distal femoral epiphysis in rabbits. II (ab), July, 146

KIBLER, R. S. See GÉRBASI, F. S.

KIDNEYS  
See also Pyelography; Urinary Tract  
—internal diameter of renal artery and renal function (ab), N. S. R. Maluf, Aug., 299

—perirenal (Gerota's) fascitis (ab), John A. Hutch et al., Nov., 819

—renal function after aortography with large contrast medium doses; experimental study in dogs (ab), N. P. G. Edling et al., Sept., 470

—unilateral renal injury due to translumbar aortography (ab), C. G. Clark, Aug., 298

blood supply. See also Aneurysm, renal; Arteries, renal; Veins, renal

—nephrographic effect in renal angiography; an experimental study in dogs (ab), Nils P. G. Edling and C. G. Helander, Nov., 809

calcification  
—nephrocalcification: roentgenologic, biophysical and histologic study (ab), Bengt Engfeldt and Curt Lagergren, Sept., 482

calculi  
—use of miniature film (renogram) for kidney stone surgery (ab), C. R. Marquardt et al., Sept., 482

cancer  
—metastatic malignant melanoma of kidney simulating a primary neoplasm; case (ab), Colvin H. Agnew, Sept., 482

cysts  
—sponge kidney; case (ab), G. Reboul et al., Sept., 482

diseases  
—hyelographic diagnosis of lesions of renal papillae and calyces in cases of hematuria (ab), Benjamin S. Abeshouse and Julian O. Salik, Sept., 481

—pyelography in renal disease with hypertension: correlation between pyelographic findings and differential renal function studies, Lucy F. Squire and Jorgen U. Schlegel, Aug., 849

effects of irradiation  
—acute radiation nephritis in childhood (ab), J. Swanson Beck, Aug., 326

—hypertension following x-irradiation of kidneys (ab), Clifford Wilson et al., Aug., 326

—radiation nephritis: a clinicopathologic correlation of three surviving cases (ab), Sheldon R. Cogan and Israel I. Ritter, Aug., 325

—radiation nephritis; fatal case (ab), Bernard F. Schreiner and Robert M. Greendyke, Dec., 962

pelvis  
—spontaneous extravasation during urography (ab), William E. Forsythe et al., Sept., 483

roentgenography. See also Pyelography; other subheads under Kidneys  
—clinical evaluation of nephrotomography (ab), W. F. W. Southwood and V. F. Marshall, Oct., 659

tumors  
—clinical and roentgenologic considerations in 43 cases of renal tumors (ab), Salvatore Galdini and Augusto Ciria, Aug., 313

**KIDNEYS, tumors—cont.**  
 —metastatic malignant melanoma of kidney simulating a primary neoplasm; case (ab), Colvin H. Agnew, Sept., 482  
 —Wilms' tumor; 71 cases (ab), John K. Lattimer et al., Nov., 825

**KIEFER, EVERETT D., and SMEDAL, MAGNUS L.:** Radiation therapy for stoma ulcer occurring after subtotal gastrectomy (ab), Nov., 825

**KIELY, BRIAN, ADAMS, PAUL, JR., ANDERSON, RAY C., and LESTER, RICHARD G.:** The ostium primum syndrome (ab), July, 131

—See MELLINS, HARRY Z.

**KIER, LAWRENCE C.:** See SALZMAN, EMANUEL

**KIESEWETTER, WILLIAM B., and SMITH, JOHN W.:** Malrotation of the midgut in infancy and childhood (ab), Aug., 305

**KILPATRICK, R.:** See WILSON, G. M.

**KIM, YOUNG S.:** See LOKEN, MERLE K.

**KIMELDORF, DONALD J.:** See NEWSOM, BERNARD D.

**KINCAID, OWINGS, W., and DAVIS, GEORGE D.:** Abdominal aortography (ab), Sept., 470

—See VICKERS, CHARLES W.

**KING, W. E.:** See CLARKE, K. H.

**KINSEY, FRANK R.:** Pain in the neck: the radiologist's contribution (ab), Oct., 640

**KIRKLIN-WEBER MEMORIAL LECTURE, Nov., 789**

**KIRKPATRICK, JOHN A., and OLMSTED, RICHARD W.:** Cineroentgenographic study of pharyngeal function related to speech, Oct., 557

**KIVEL, RAYMOND, See MENA, ISMAEL**

**KJELLGREN, OLLE:** The radiation reaction in the vaginal smear and its prognostic significance: studies on radiologically treated cases of cancer of the uterine cervix (ab), Aug., 319

**KLATTE, EUGENE C., CAMPBELL, JOHN A., and LURIE, PAUL R.:** Technical factors in selective cineradiangiography, Oct., 539

**KLEMPASKAYA, N. N., PETROV, R. V., and ILYINA, L. I.:** Biological effect of the cellular structures in normal and irradiated rabbits (ab), Nov., 838

**KLINGLER, M.:** See STRICKER, E.

**KNEE**  
 —effects of kwashiorkor on development of bones of knee (ab), P. R. M. Jones and R. F. A. Dean, Dec., 952

**roentgenography**  
 —radiologic study of physiologic knock-knee in childhood (ab), D. W. MacEwan and J. S. Dunbar, Oct., 658  
 —study of congenital meniscal malformations by pneumoarthrography (ab), J. Philipoen, Nov., 818  
 —tomographic analysis of depressed fractures within knee joint, and of injuries to cruciate ligaments (ab), Stig Fagerberg, Sept., 479

**KNOBLICH, HILDA, SAYERS, MARTIN P., and HOWARD, WILLIAM H. R.:** The relationship between findings in pneumoencephalograms and clinical behavior (ab), Sept., 463

**KNOCK-KNEE. See Knee**

**KNUTSSON, BERTIL, and WIBERG, GUNNAR:** On surgically treated herniated intervertebral discs (ab), Nov., 816

**KOHLER'S DISEASE.** See Scaphoid Bone, Tarsal

**KOLAR, JAROMIR, and VRABEC, RADKO:** Periarticular soft-tissue changes as a late consequence of burns (ab), Nov., 815

**KONWALER, BENJAMIN E.:** See PAYSEUR, COYT R.

**KOPPENSTEIN, E.:** The meaning of a gas bubble projected above the level of the diaphragm (ab), Dec., 946

**KOTTMAYER, PETER. See MELLINS, HARRY Z.**

**KRABBEHNHOFT, KENNETH L.:** See COOK, JAMES C.

**KRAVITZ, DANIEL. See LEVITT, JESSE M.**

**KREBS, JOHN S., BRAUER, RALPH W., and KALBACH, HARVEY:** The estimation of the nonreparable injury caused by ionizing radiation (ab), Nov., 835

**KRIEG, P., RYNCKI, P., and BUGNION, M.:** Early diagnosis of malignant tumors of the stomach: a case of round-cell sarcoma (ab), Oct., 649

**KRIEGER, HARVEY. See ABBOTT, WILLIAM E.**

**KRISS, JOSEPH P., FIELD, EDWIN O., and GIBBS, JOHN E.:** Effect of anaemia and transfusion polycythaemia on phosphorus and iron uptake in erythrocyte precursors in rat bone marrow, studied by means of a triple tracer technique with  $^{32}P$ ,  $^{59}Fe$  and  $^{51}Cr$  (ab), Dec., 962

**KROKOWSKI, E.:** Sieve (grid) radiotherapy of subcutaneous lymphoma (ab), Dec., 958

**KRONSWITZ, HELMUT. See ERNST, HELMUT**

**KROO, M. See NETTL, S.**

**KRYPTON, RADIOACTIVE.** See Radioactivity, radio-krypton

**KRYSHTAL, LIDIA. See HARPER, PAUL V.**

**KUMMERLE, F.:** Incarceration of the stomach and intestine after traumatic rupture of the diaphragm (ab), Sept., 474

**KUMMER, ALFRED J. See SCATLIFF, JAMES H.**

**KURLAND, GEORGE S., GOLODETZ, ARNOLD, HAMOLSKY, MILTON W., and FREEDBERG, A. STONE:** Thyroid function in supraventricular tachycardias: turnover of intravenously infused  $^{131}I$ -labeled thyroxine and the red blood cell uptake of  $^{131}I$ -labeled  $\beta$ -triiodothyronine (ab), Nov., 829

**KURNICK, N. B., MONTANO, ANDREW, GERDES, JAMES C., and FEDER, BERNARD H.:** Preliminary observations on the treatment of post-irradiation hematopoietic depression in man by the infusion of stored autogenous bone marrow (ab), Sept., 497

**KUZMAN, WILLIAM J., YUSKIS, ANTON S., and CAR-MICHAEL, DAVID B.:** Anomalous left coronary artery arising from the pulmonary artery (ab), Nov., 806

**KWASHIORKOR.** See Nutrition

**KYMOGRAPHY**  
 —new kymographic sign of myocardial infarct: dissociation of kymographic layers (ab), Ismet Sayman, Nov., 805

—roentgen kymographic sign of gastrocardiac syndrome of Römhild (ab), H. Grasser, Dec., 943

**electrokymography.** See Heart, beat

**KYPHOSIS.** See Spine, curvature

**L**

**L'ABBE, R., LEBEL, E., and PINSONNEAULT, G.:** Effects of prednisolone in the treatment of superficial radiation lesions of the skin and mucosae (ab), July, 156

**LABOR**  
 —intrapartum lateral x-ray in conduct of dystocic labors (ab), Leonard M. Roberts et al., Oct., 656

—method of transfer of labor contractions to contents of uterus (ab), G. Narik, Dec., 952

—studies to detect escape of amniotic fluid into maternal circulation during parturition (ab), Richard A. Sparre and Jack A. Pritchard, Sept., 491

**LACRIMAL ORGANS**  
 —lacrimal air anomalies (ab), Jesse M. Levitt and Daniel Kravitz, Dec., 938

**LAFFERTY, JOHN O.:** Duodenal ulcers in children with notes on their etiology, Sept., 374

**LAGERGREN, CURT. See ENGFELDT, BENGT**

**LAMBERG, B.-A., WAHLBERG, PETER, WEGELIUS, OTTO, HELLSTRÖM, GUNNAR, and FORSIUS, P. I.:** Iodine metabolism of endemic goiter on the Åland Islands (Finland) (ab), Sept., 490

**LAMERTON, L. F. See BELCHER, E. H.**

—See HINDMARSH, MARGARET

**LAMINAGRAPHY.** See Body-Section Roentgenography

**LAMPE, I. See LATOURETTE, H. B.**

**LANDMAN, JAYME, and CAMINHA, NICOLA C.:** Thorotrast disease (ab), Aug., 327

**LANG, ERICH K., PHILLIPS, LEON A., and McAFFEE, JOHN G.:** Angiocardiographic features of the Bland-White-Garland syndrome (ab), Nov., 807

**LANIER, RAYMOND R.:** Precautions in medical radiology (ab), July, 155

—See WHITEHEAD, RICHARD W.

**LAREAU, D. G. See HAHN, P. F.**

**LARSSON, L.-G. See HELANDER, C. G.**

**LARYNX**  
 —calcification of hyoid, thyroid and tracheal cartilages in infancy; case (ab), P. E. Russo and C. G. Coin, July, 130

**Cancer**  
 —carcinoma of extrinsic larynx (ab), Frank C. Marchetta et al., Aug., 316

—carcinoma of larynx (ab), Glenn E. Sheline and Robert S. Stone, Oct., 664

—carcinoma of larynx: results obtained by surgery and external radiation in 93 cases (ab), William M. S. Ironside et al., Dec., 956

—radiological aspects of new growths of larynx (ab), Satyen Basu, Aug., 288

**tumors**  
 —roentgenologic characteristics of chondroma of larynx (ab), Brit B. Gay, Jr., et al., Oct., 639

**LATHROP, KATHERINE. See HARPER, PAUL V.**

**LATOURETTE, H. B., SIMONS, C. S., and LAMPE, I.:** A localization scheme for radiation therapy planning with the theratron, Nov., 762

**LATTIMER, JOHN K., MELICOW, MEYER M., and USON, AURELIO C.:** Wilms tumor: a report of 71 cases (ab), Nov., 825

—See USON, AURELIO C.

**LAUFER, A. See SCHORR, S.**

**LAVAURS and GRAS:** Value of angiography in the diagnosis of hydatid cysts of the heart (ab), Oct., 645

**LAWRENCE, G. H. See BOTSEAS, D. S.**

**LAWRENCE, JOHN S. See PERRY, SEYMOUR**

**LAXATIVES.** See Cathartics

**LEA, A. J. See ABBATT, JOHN D.**

**LEACHMAN, ROBERT D. See SINGLETON, EDWARD B.**

**LEAVENS, MILAM E. See MacCARTY, COLLIN S.**

**LEBEDEVA, G. D. See MAREI, A. N.**

**LEBEL, E. See L'ABBE, R.**

**LEDERER, I. T. See MUNK, J.**

**LEDINGHAM, J. M. See WILSON, CLIFFORD**

**LEE, ROBERT E., and FINBY, NATHANIEL:** Jejunal and ileal diverticulosis (ab), Aug., 304

**LEENHARDT, P., COLIN, R., and POURQUIER, H.:** Pelvic lymphography (ab), Sept., 484

**LEFFINGWELL, T. P. See HARTWIG, Q. L.**

**LEFROY, R. B.:** The Nisbet symposium: collagen disease, Part I: General aspects (ab), Oct., 662

**LEGS. See Extremities**

LEHMAN, J. STAUFFER, LEMMON, WILLIAM M., BOYER, RANDAL A., and FITCH, EDWARD A.: Suprasternal thoracic aortography. Suprasternal trans-thoracic needle puncture opacification of the thoracic aorta. July, 18

—See LEHMAN, WILLIAM M.

LEIB, GILBERT M. P., DAVIS, W. N., BROWN, TRAVE, and MCQUIGGAN, MARK: Chronic pulmonary insufficiency secondary to silo-filter's disease (ab), Aug., 290

LEIOMYOMA. See Tumors, myoma

LEIOMYOSARCOMA. See Sarcoma, myosarcoma

LE MELLETIER, J., REINE, L., GILBRIN, E., and CAULET, T. R.: Bronchopulmonary complications revealing an unrecognized megasophagus (ab), Nov., 893

LEMM, FRANCES J. See SPECTOR, SAMUEL

LEMMON, WILLIAM M., LEHMAN, J. STAUFFER, and BOYER, RANDAL A.: Suprasternal transaortic coronary arteriography (ab), Nov., 897

—See LEHMAN, J. STAUFFER

LENTINO, WALTER, ZARET, MILTON M., ROSSIGNOL, BERTRAND, and RUBENFIELD, SIDNEY: Treatment of pterygium by surgery followed by beta radiation. An analysis of 250 cases (ab), Dec., 99

LENZI, MARIO, BRAMERI, CARLO, and BARACCHI, FRANCO: Roentgen tube with bifocal rotating cathode for the production of convergent beams (ab), Aug., 320

LERTORA, M. See GHIRARDI, L.

LESHER, S., and VOGEL, H. H., Jr.: A comparative histological study of duodenal damage produced by fission neutrons and Co<sub>60</sub> gamma rays (ab), Oct., 667

LESLIE, E. V. See BROADBRIDGE, A. T.

LESLIE, W. G. See TIBBS, D. J.

LESSARD, R., BERNIER, J. P., and MORIN, Y.: Physiological studies on herberi heart disease by injection of radioactive material (ab), Nov., 834

LESSMANN, FRANZ P., and SCHOBINGER, ROBERT: Intra-ossous venography in portal hypertension (ab), Dec., 946

—and WALDROP, GRACE M.: The value of intraosseous venography in tumors of the female pelvis (ab), Oct., 648

LESTER, RICHARD G. See GREENSPAN, RICHARD H.

—See KIELY, BRIAN

LETTERS TO EDITOR

Comment on Dr. Ira Kaplan's article on "Genetic Effects in Children and Grandchildren of Women Treated for Infertility and Sterility by Roentgen Therapy," R. R. Newell, Aug., 25; reply by Dr. Kaplan, Nov., 79

Concerning article by Dr. Esguerra Gomez on pulmonary alveolar microthirosis, W. R. Cole, Nov., 790; reply by Dr. Esguerra Gomez, Nov., 791

Radiation hazards (three-cornered film), R. R. Newell, Nov., 791

LEUKEMIA

—acute granulocytic leukemia after radioactive iodine therapy for hyperthyroidism (ab), William M. Kennedy and Robert G. Fish, Nov., 830

—acute leukemia in infant following excessive intrauterine irradiation (ab), F. W. Gunz et al., Sept., 495

—estimate of potential leukemogenic factor in diagnostic use of x-rays (ab), J. H. Martin, July, 154

—factors influencing incidence of leukemia: special consideration of role of ionizing radiation (ab), E. E. Schwartz and A. C. Upton, Aug., 327

—intravenous radioactive gold in treatment of chronic leukemia: comparison of results with conventional roentgen therapy to splenic area (ab), P. F. Hahn et al., Oct., 665

—lethal whole-body irradiation: some experimental issues (ab), Peter Ilbery, Oct., 667

—leukemogens (ab), John D. Abbott and A. J. Lea, Sept., 494

—studies with transplantable AK4 mouse leukemia. III. Effect of spleen and marrow shielding on AK4 leukemic implants in homologous strains of irradiated mice (ab), Irene U. Boone et al., Aug., 328

LEUKOCYTES

See also Eosinophils; Granulocytes; Leukemia; Lymphocytes

—comparison of effects on Shwartzman phenomenon of leukopenia produced by nitrogen mustard and by whole-body irradiation (ab), Douglas E. Johnstone and Joe W. Howland, Aug., 328

—radiation dose measurements and leukocyte count in rabbits (ab), M. Held et al., Sept., 498

LEUKOPENIA. See Leukocytes

LEVENE, GEORGE. See KAUFMAN, S. A.

LEVY, STANLEY. See ABBOTT, WILLIAM E.

LEVINE, JACK, KENIN, ABEL, and SPINNER, MORTON: Non-union of a fracture of the anterior superior process of the calcaneus. Case report. (ab), Nov., 818

LEVITT, JESSE M., and KRAVITZ, DANIEL: Lacrimal air anomalies (ab), Dec., 938

LEVY, RICHARD P. See JEFFERIES, WILLIAM M.C.

—See TURELL, DAVID J.

LEWIN, HANS. See ZELMAN, SAMUEL

LEWIS, C. W. D.: Symposium: myelography in the diagnosis of diseases of the spinal canal. Part 4: Discussion (ab), Oct., 657

LEWIS, REUBEN. See KAY, JEROME HAROLD

LEWIS, YEVETTE S., QUASTLER, HENRY, and SVIHLA, GEORGE: Ultraviolet microscopy of x-irradiated intestine (ab), Sept., 496

LIEBERMAN, JESSE. See GORSON, ROBERT OWEN

LIEBNER, EDWIN J.: Roentgenographic study of congenital choledochal cysts. Pre- and postoperative analysis of five cases (ab), Oct., 654

LIEMER, MARTIN D. See VANTRAPPEN, GASTON

LIGAMENTS

cruciate

—tomographic analysis of depressed fractures within knee joint, and of injuries to cruciate ligaments (ab), Stig Fagerberg, Sept., 479

dentate

—arterial anomalies of spinal cord: myelographic diagnosis and treatment by section of dental ligaments (ab), Paul Teng and Marvin J. Shapiro, Sept., 480

hepatic

—cyst of left triangular ligament of liver. Andrew K. Poznanski, Dec., 896

LILLEHEI, C. WALTON. See GONZALEZ-CERNA, JUAN

LIMBURG, D. See HAEX, A. J. CH.

LINDBOM, A. See HELANDER, C. G.

LINDE, LEONARD M. See SCHMUTZER, KARL J.

LINDGREN, MARTIN: On tolerance of brain tissue and sensitivity of brain tumours to irradiation (ab), July, 154

—See ARNER, BENGT

—See BERG, NILS O.

LINNOVIST, BENGT. See ARNER, BENGT

LINDSAY, JOHN R. See IRONSIDE, WILLIAM M. S.

LINDSAY, STUART. See SHELLINE, GLENN E.

LINEAR ENERGY TRANSFER (LET). See Neutrons

LIPIDS. See Fat

LIPIODOL. See Iodine and Iodine Compounds

LIPS

—treatment of carcinoma of lower lip, J. A. del Regato and J. M. Sala, Dec., 839

LISA, JAMES R. See ROSENBLATT, MILTON B.

LISSNER, J.: The condition of the pulmonary vessels in bronchial carcinoma: an electrokymographic investigation (ab), Dec., 939

LITHIUM, RADIOACTIVE. See Radioactivity, radioactive lithium

LITTELL, ARTHUR S. See TURELL, DAVID J.

LITTLE, ETHNA W.: A case of Robert's pelvis (ab), Sept., 478

LITTLE, JOHN N. See BREWER, LYMAN A., III

LIVER

See also Ligaments, hepatic

—deposition and storage of vitamin B<sub>12</sub> in normal and diseased liver (ab), George B. Jerzy Glass, Dec., 961

—determination of cardiopulmonary circulation time by external scintillation counting (ab), Ismael Mena et al., Nov., 833

—internal irradiation of dogs with radioactive colloidal gold: synergistic effect of iron (ab), P. F. Hahn and H. C. Meng, Sept., 491

—interposition of loop of ileum between dome of diaphragm and liver (ab), M. G. Varadarajan, Dec., 947

—necropsy evaluation of gas contrast roentgen visualization of liver and spleen (ab), Samuel Zelman, Oct., 652

—percutaneous selective angiography of celiac artery (value in diagnosis of morbid processes of pancreas, liver, and spleen) (ab), Per Odman, Aug., 298

blood supply

—external recording method for estimating hepatic blood flow with use of radiogold (ab), Joseph S. Burkle and Marvin L. Gliedman, Nov., 831

cancer

—venographic and scintillographic demonstration of liver metastases (ab), C. G. Helander et al., Oct., 652

LIVERUD, KJELL: Occluding dissecting aneurysm as a complication of carotid angiography (ab), Nov., 808

Technique in percutaneous carotid and vertebral angiography with polyethylene catheters (ab), Nov., 808

LOBECTOMY. See Lungs, tumors

LOCHTE, HARRY L., Jr. See THOMAS, E. DONNALL

LODWICK, GWILYM S.: Juvenile unicameral bone cyst: a roentgen re-appraisal (ab), July, 145

LOHR, HN., SCHOLTE, A., and GRILL, W.: Normal and pathologic pulmonary segments in the selective angiogram (ab), Nov., 801

LOKEN, MERLE K., KIM, YOUNG S., MOSSER, DONN G., and MARVIN, JAMES F.: The effect of combined irradiation and chemotherapy on cancer growth, with special reference to studies with folic acid analogues, Aug., 166

LOMBARDERO, M. See FIANDRA, O.

LOMBARDI, G., and MORELLO, G.: Rare causes of enlargement of the spinal canal (ab), July, 142

LOPEZ, SOTO R. See FIANDRA, O.

LOQUVAM, GEORGE S. See HUTCH, JOHN A.

LOVE, J. GRAFTON. See MacCARTY, COLLIN S.

LOVELIDGE, RALPH. See GREENING, ROY R.

LOVELL, B. K. See DeGINDER, W. L.

LOWE, J. See BEWLEY, D. K.

LOWE, K. G. See WATSON, HAMISH

LOWREY, GEORGE H., ASTER, RICHARD H., CARR, EDWARD A., RAMON, GOVIND, BEIERWALTES, WILLIAM H., and SPAFFORD, NORMA R.: Early diagnostic criteria of congenital hypothyroidism: a comprehensive study of forty-nine cretins (ab), Aug., 288

**OWEN** *ly of con-*  
**TON** *stoperative*  
**within knee** *(ab), Stig*  
**ligaments** *480*  
**Andrew K.**  
**VA, JUAN**  
**J.** *issue and*  
**ib, July,**  
**I. S.**  
**ns**  
**gato and**  
**ssels in**  
**vestigat-**  
**radiog-**  
**s (ab),**  
**al and**  
**external**  
**Nov.**  
**olloidal**  
**in and**  
**dragma**  
**ization**  
**(value**  
**r, and**  
**blood**  
**e and**  
**liver**  
**as a**  
**angiog-**  
**cyst;**  
**and**  
**ngio-**  
**G.** *joined*  
**with**  
**genes,**  
**en-**  
**RR,**  
**ES,**  
**early**  
**ug.**

**LUCAS, ARTHUR C.** See **TROUT, E. DALE**

**LÜDEKE, H., and POSCHL, M.**: An accessory lung communicating with the bronchial tree (ab), Dec., 939

**LUIPPOLD, HELEN J.** See **CONGER, ALAN D.**

**ULL, GEORGE F., Jr., and WINN, DEAN F., Jr.**: Chronic fibrous mediastinitis due to *Histoplasma capsulatum* (histoplasmal mediastinitis). Report of three cases with different presenting symptoms, Sept., 367

**LUND, PAUL K.** See **BLACKMAN, JAMES**

**LUND, RONALD R.** See **SAMMONS, BILLY P.**

**LUNGS**  
See also **Bronchi**; **Bronchiectasis**; **Thorax**  
**abnormalities**  
—accessory lung communicating with bronchial tree (ab), W. Lüdeke and M. Poschl, Dec., 939

**amebiasis.** See **Amebiasis**

**anatomy**  
—bronchopulmonary segmental anatomy and bronchography (ab), Chauncey N. Borman, Oct., 640

—normal and pathologic pulmonary segments in selective angiogram (ab), Hh. Lohr et al., Nov., 801

**blood supply.** See also **Arteries**, **pulmonary**; **Embolism**; **Lungs, anatomy**; **Lungs, collapse**; **Fistula, arteriovenous**; **Veins, pulmonary**  
—condition of pulmonary vessels in bronchial carcinoma: an electrokymographic investigation (ab), J. L. Lissner, Dec., 939

—correlation between various assessments of pulmonary arterial pressure in mitral stenosis (ab), J. F. Boyd et al., Aug., 297

—Eisenmenger syndrome or pulmonary hypertension with reversed central shunt (ab), Paul Wood, July, 131

—high pressure patent ductus arteriosus; 3 cases (ab), Jerome H. Kay et al., Dec., 944

—patent ductus arteriosus with pulmonary hypertension simulating ventricular septal defect: diagnostic criteria in 10 surgically proved cases (ab), Juan L. Gonzalez-Cerna and C. Walton Lillehei, Sept., 468

—pulmonary hypertension due to pulmonary arterial coarctation, Karl H. Falkenbach, Norman Zuehlein, Andrew H. Dowdy and Bernard J. O'Loughlin, Oct., 575

—pulmonary hypertension in congenital heart disease (ab), William Evans and D. S. Short, Aug., 293

—significance of alterations in the lung arterial pattern, William H. Sprunt, Richard M. Peters, and David L. Holder, July, 1

—some basic principles in diagnosis of chest diseases (intrapulmonary vessels), Benjamin Felson (Moderator), Felix G. Fleischner, John R. McDonald and Coleman B. Rubin, Nov., 740

—unilateral pulmonary embolism with increased compensatory circulation through unoccluded lung: roentgen observations, Felix G. Fleischner, Oct., 591

—vascular pattern of lung as seen in routine and tomographic studies, Elliott Michelson and Julian O. Salik, Oct., 511

—wedge pulmonary arteriography: its application in congenital and acquired heart disease, A. L. Loomis Bell, Jr., Seiichi Shimomura, W. James Guthrie, Herbert F. Hempel, Hugh F. Fitzpatrick and Charles F. Begg, Oct., 566

**calculi**  
—concerning article by Dr. Esguerra Gómez on pulmonary alveolar microlithiasis (letter to editor), W. R. Cole, Nov., 790; reply by Dr. Esguerra Gómez, Nov., 791

—pulmonary alveolar microlithiasis (ab), W. R. Cole, Nov., 802

**cancer**  
—accelerated palliative radiation therapy of bronchial carcinoma with 250-ky roentgen rays, W. L. de Ginder and B. K. Lovell, Nov., 684

—*alveolar-cell carcinoma*. See **Lungs, tumors**

—angiography as aid to identification of nonresectable pulmonary carcinomas (ab), Stanley M. Wyman and Earl W. Wilkins, Jr., Oct., 640

—bronchogenic carcinoma arising in lung cyst; case (ab), S. Brunner, Dec., 940

—carcinoma: practical classification for early diagnosis and surgical treatment (ab), Lyman A. Brewer, III, et al., Aug., 288

—cavitory carcinoma (ab), Morris M. Culiner et al., Oct., 641

—condition of pulmonary vessels in bronchial carcinoma: an electrokymographic investigation (ab), J. Lissner, Dec., 939

—pulmonary tuberculosis associated with carcinoma of lung (ab), A. J. Christoforidis and R. H. Browning, Dec., 940

—radiological diagnosis of primary lung tumors (ab), N. G. Gadekar, Aug., 289

—suspicion of lung cancer (ab), H. Birkhäuser, Sept., 467

—treatment of bronchogenic cancer with conventional x-rays according to a specific time-dose pattern, Sidney Rubenfeld and Gustave Kaplan, Nov., 671

—treatment of lung tumors with a radioactive gold-carbon suspension; animal experiments (ab), Helmut Ernst et al., Sept., 491

**cavitation.** See also **Lungs, cancer**  
—aseptic cavitation of pseudotumors in anthracosilicosis: clinical and radiological study (ab), J. Prignot and R. Van de Velde, Aug., 292

**collapse**  
—opacification of an atelectatic lung segment during selective angiography, Harold G. Jacobson, Berta M. Rubinstein and Doris J. W. Escher, July, 95

**cysts.** See also **Lungs, tumors**  
—bronchogenic carcinoma arising in lung cyst; case (ab), S. Brunner, Dec., 940

—*muco-pneumonic pseudo air cysts* in children (ab), K. Schlager, Aug., 291

**diseases.** See also **Histoplasmosis**; **Pneumoconiosis**; **Pneumonia**  
—bronchopulmonary complications revealing an unrecognized megaesophagus (ab), J. Le Melletier et al., Nov., 803

—chronic pulmonary insufficiency secondary to silo-filler's disease (ab), Gilbert M. P. Leib et al., Aug., 290

—dorsal kyphosis in chronic obstructive lung disease (ab), Denis F. J. Halmagyi, Dec., 951

—pulmonary alveolar proteinosis: a progressive, diffuse, fatal pulmonary disease (ab), Coyt R. Payseur et al., Oct., 643

—pulmonary paragonimiasis: evaluation of roentgen findings in 38 positive sputum patients in an endemic area in Thailand (ab), Romsat Suwanik and Chamlong Harinsut, Dec., 942

—some basic principles in diagnosis of chest diseases (coin lesions), Benjamin Felson (Moderator), Felix G. Fleischner, John R. McDonald and Coleman B. Rubin, Nov., 740

—surgical treatment of some pulmonary conditions in childhood (ab), M. L. Cantlin et al., Oct., 643

—uncommon roentgen patterns of pulmonary sarcoidosis (ab), Benjamin Felson, Aug., 289

**edema**  
—roentgen diagnosis of pulmonary edema (ab), G. Herrnheiser, Aug., 290

**effects of radiation**  
—pulmonary radiation reaction: a vital-capacity and time-dose study, James R. Gish, E. O. Coates, Lucille A. DuSault and Howard P. Doub, Nov., 679

**empysema.** See **Emphysema**

**fibrosis**  
—diffuse interstitial pulmonary fibrosis (Hamman-Rich syndrome); 3 cases (ab), Robert J. Carabasi, Sept., 466

—pulmonary infiltration and fibrosis of unknown etiology: the risk of developing active pulmonary tuberculosis (ab), John F. Chace et al., Dec., 941

**mycosis.** See **Actinomycosis**; **Aspergillosis**; **Blastomycosis**; **Histoplasmosis**

**pathology**  
—acute mercury vapor poisoning; report of 4 cases with radiographic and pathologic correlation, Ching Tseng Teng and James C. Brennan, Sept., 354

—clinical, radiographic, and pathological studies of lungs of electric-arc and oxyacetylene welders (ab), H. E. Harding et al., Sept., 466

—dermatomycosis with pulmonary lesions (ab), Jerome Goldfischer and Eli H. Rubin, Nov., 803

—emphysema and the lungs of the aged: a clinical study; preliminary report (ab), Edgar Mayer et al., July, 130

—lungs in scleroderma (ab), E. C. Bonard, July, 130

**physiology**  
—problem of absorption of liquids from lung, particularly bronchographic contrast material (ab), M. Roth, Dec., 942

**roentgenography.** See also **Bronchi**; **roentgenography**; **Histoplasmosis**; **Pneumoconiosis**; **Thorax**; **roentgenography**; **other subheads under Lungs**; **etc.**

—changes in chest roentgenogram in collagen diseases (ab), W. Bessler, Oct., 643

—lung changes in recent influenza epidemic (ab), Raymond W. Galloway and Ronald S. Miller, Nov., 802

—pulmonary findings in collagen diseases (ed), William R. Eyer, July, 109

—pulmonary manifestations in collagen diseases (ab), Charles M. Nice, Jr., et al., Dec., 941

**sequestration**  
—anomalous artery in intralobar bronchopulmonary sequestration; 2 cases demonstrated by angiography (ab), Franklyn P. Gerard and Harold A. Lyons, Aug., 299

**surgeries.** See also **Lungs, diseases**; **Lungs, tumors**  
—surgical experiences with pulmonary coin lesions (ab), Otto V. Hibma and Edward I. Boldon, Sept., 467

**tuberculosis.** See **Tuberculosis, Pulmonary tumors**  
—aseptic cavitation of pseudotumors in anthracosilicosis: clinical and radiological study (ab), J. Prignot and R. Van de Velde, Aug., 292

—cystic lung lesions from metastatic sarcoma (ab), Neil E. Crow and Byron G. Brodgon, Dec., 941

—Ewing's sarcoma: 10-year survivals; report of case with recurrent pulmonary metastases (ab), Harold N. Harrison, Sept., 487

—extraosseous infiltration in multiple myeloma, James A. Gilroy and Andrew B. Adams, Sept., 406

—metastatic pulmonary melanoma of 15 months duration (ab), Milton B. Rosenblatt and James R. Lisa, July, 130

—origin and diagnosis of alveolar-cell carcinoma of lung (pulmonary adenomatosis) (ab), R. Pohl, Dec., 939

—primary fibrosarcoma of lung in young child; case treated by lobectomy and cobalt therapy (ab), F. S. Gerbasi et al., Dec., 957

**LURIE, PAUL R.** See **KLATTE, EUGENE C.**

**LUSTED, LEE B.**: Current technical problems in cineradiography, Oct., 527

**LUTEMBACHER'S SYNDROME.** See **Heart, abnormalities**

**LUTTERBECK, EUGENE F.** See **BAKER, WILLIAM J.**

**LYMPH NODES**

- radiologic possibilities in diagnosis of lumbar aortic lymph node enlargement by means of retroperitoneal air insufflation (ab), G. Carnevali and S. Di Pietro, Oct., 661
- treatment of mouse lymphosarcoma by total-body x-irradiation and by injection of bone marrow and lymph-node cells (ab), M. J. de Vries and O. Vos, Nov., 837
- cancer**
- pelvic lymph node dissection following radiotherapy (ab), Mary Jane Gray et al., July, 150

**LYMPHATIC SYSTEM**

- pelvic lymphography (ab), P. Leenhardt et al., Sept., 484
- regeneration of surgically divided lymph vessels; experimental study on rabbit's ear (ab), Sven Bellman and Bo Odén, Nov., 821

**LYMPHOCYTES**

- effect of x-rays on  $Fe^{59}$ -labeled granulocytes and lymphocytes of rabbit (ab), Luigi Resegotti, July, 160
- rate of production of  $Pb^{210}$ -labeled lymphocytes (ab), Seymour Perry et al., Dec., 962

**LYMPHOID TISSUE**

See also **Lymphatic System; Tumors, lymphoma**

- effects of donor and host lymphoid and myeloid tissue injections in lethally x-irradiated mice treated with rat bone marrow (ab), George W. Santos and Leonard J. Cole, July, 159
- lymphatic tissue changes in lethally irradiated mice given spleen cells intravenously (ab), C. C. Congdon et al., July, 160

**LYMPHOMA.** See **Tumors, lymphoma**

**LYMPHOSARCOMA.** See **Sarcoma, lymphosarcoma; Tumors, experimental**

**LYNNS, THOMAS E.** See **WAUGH, JOHN M.**

**LYVONS, A. R.** See **EDELSTYN, G. A.**

**LYVONS, HAROLD A.** See **GERARD, FRANKLYN P.**

**M**

**McAFEE, JOHN G.** See **LANG, ERICH K.**

**McCALLISTER, JOHN D.** See **PERRYMAN, CHARLES R.**

**McCALLISTER, ROBERT M.** See **CORIELL, LEWIS L.**

**MacCARTY, COLLIN S.**, LEAVENS, MILAM E., LOVE, J., GRAFTON, and KERNONAN, JAMES W.: Dermoid and epidermoid tumors in the central nervous system of adults (ab), Dec., 954

**McCORT, JAMES J.**: Radiographic signs of acute suppurative cholecystitis (ab), Dec., 948

**MC COY, JOSEPH B., JR.** See **WOLTZ, JOHN H. E.**

**MC CURDY, PAUL R.** and **RATH, CHARLES E.**: Splenectomy in hemolytic anemia: results predicted by body scanning after injection of  $Cr^{51}$ -tagged red cells (ab), Aug., 322

**McDONALD, JOHN R.** See **FELSON, BENJAMIN**

**McDONALD, RICHARD T.** See **SZILAGYI, D. EMERICK**

**MacEWAN, D. W.**, and **DUNBAR, J. S.**: Radiologic study of physiologic knock knee in childhood (ab), Oct., 658

**McFALL, RUSSELL A.**, DOWDY, ANDREW H., and O'LOUGHLIN, BERNARD J.: Reaction of the heart to selective angiography (ab), Nov., 803

**MacGREGOR, G. A.**, and **WAGNER, H.**: The influence of age on excretion of radioactive iodine (ab), Sept., 489

**McGUIRE, TOM H.** See **HARDIN, CREIGHTON A.**

**MACH, R. S.** See **DEMANET, J. C.**

**MACHELLA, THOMAS E.**: Functional disturbances of the gastrointestinal tract, Sept., 379

**MacINTYRE, WILLIAM J.**, FRIEDELL, HYMER L., GOMEZ CRESPO, GODOFREDO, and REJALI, ABBA M.: The visualization of internal organs by accentuation scintillation scanning techniques, Sept., 329

**McKENNEY, JOHN F.** See **HIGHTOWER, NICHOLAS C., Jr.**

**McKINNON, K. J.** See **SPROUL, R. D.**

**McKISSOCK, WYLIE**: Some aspects of subarachnoid hemorrhage—a symposium. I. Clinical and surgical aspects of ruptured intracranial aneurysms (ab), Dec., 937

**McLAUGHLIN, A. I. G.** See **HARDING, H. E.**

**MacLEAN, C. D. T.**: The lower oesophageal ring or groove (ab), July, 138

**MCLENNAN, CHAS. E.**: The argument against preoperative radium for endometrial cancer (ab), July, 150

**MacMORAN, JAY W.** See **YOUNG, BARTON R.**

**MCNAMARA, DAN G.** See **SINGLETON, EDWARD B.**

**MCQUIGGAN, MARK.** See **LEIB, GILBERT M. P.**

**MADDOCK, CHARLOTTE L.** See **D'ANGIO, GIULIO J.**

**MAFFUCCI'S SYNDROME.** See **Dyschondroplasia**

**MAGALOTTI, MARION F.**: Plaster casts for radiation therapy of oral carcinoma, July, 100

**MAGEE, RICHARD B.**, and **KEAGY, R. MARVEL**: Perforation of the stomach in the newborn (ab), Sept., 474

**MAGNETIC TAPE**

- use of magnetic tape for recording radioactivity, Solomon N. Albert, H. N. Eccleston, Jr., T. Fujita, Charles H. Hunter and Chalom A. Albert, Dec., 923

**MAHMOUD, MAHMOUD EL SAYED**: The sella in health and disease. The value of the radiographic study of the sella turcica in the morbid anatomical and topographic diagnosis of intracranial tumours (ab), Sept., 464

**MAHONEY, PAUL S.**, and **O'LOUGHLIN, BERNARD J.**: Significance of calcification of the wall of the left atrium. Report of two cases, Sept., 402

**MAHRER, HERBERT A.** (obit), Sept., 459

**MAIER, K.**: A little known radiological sign of the vertebral column in ankylosing spondylitis (Strümpell-Marie-Bechterew's disease) (ab), Oct., 657

**MAISEL, BERNARD.** See **STEINBERG, ISRAEL**

**MAKINODAN, T.** See **CONGDON, C. C.**

**MALABSORPTION SYNDROME.** See **Digestive System**

**MALAN, EDMOND**: Vascular syndromes from dilatation of arteriovenous communications of the sole of the foot (ab), Sept., 472

**MALLARD, J. R.** See **GOOLDEN, A. W. G.**

**MALLEUS**

- congenital anomalies of sound-conducting organs (ab), Pekka Soila, Sept., 465

**MALM, JAMES R.** See **REEMTSMA, KEITH**

**MALSKY, STANLEY J.** See **ROSWIT, BERNARD**

**MALUF, N. S. R.**: Internal diameter of renal artery and renal function (ab), Aug., 299

**MAMELOK, ALFRED.** See **TURTZ, ARNOLD I.**

**MANGANESE, RADIOACTIVE.** See **Radioactivity, radio-manganese**

**MANGOLD, R.**: Combined gastric and duodenal ulceration. A survey of 157 cases (ab), Oct., 650

**MANOMETRY.** See **Urethra, roentgenography**

**MANSSON, BROR.** See **JONSSON, GÖSTA**

**MARBERG, KURT.**, DALITH, FRITZ, and BANK, HARRY: Dyschondroplasia with multiple hemangioma (Maffucci's syndrome) (ab), Sept., 477

**MARCHETTA, FRANK C.**, RIEGLER, HENRY C., and **MAXWELL, WALTER T.**: Carcinoma of the extrinsic larynx (ab), Aug., 316

**MARCK, A.** See **MARQUARDT, C. R.**

**MARCUS, MILTON.** See **TAUSEND, M. E.**

**MAREI, A. N.**, SAUROV, M. M., and LEBEDEVA, G. D.: Transmission of radioactive strontium through food from open water reservoirs into the human organism (ab), Nov., 833

**MARfan syndrome.** See **Arachnodactylia**

**MARGILETH, A. M.** See **GERBASI, F. S.**

**MARIE-STRÜMPPEL DISEASE.** See **Spine, arthritis**

**MARINELLI, L. D.**: Radioactivity and the human skeleton. Janeway lecture, 1958 (ab), Sept., 494

**MARK, LLÓYD K.**: Roentgen detection of early gastric neoplasm. Report of a case (ab), Oct., 649

**MARQUARDT, C. R.**, PICK, J. W., and MELAMED, A., MARCK, A., and HOLT, A. H.: The use of miniature film (renogram) for kidney stone surgery (ab), Sept., 482

**MARQUIS, R. M.** See **CRUICKSHANK, BRUCE**

**MARSHAK, RICHARD H.**, and **GERSON, ARNOLD**: Use of prone-pressure device for visualizing hiatus hernia (ab), Oct., 654

—See **ROBERTS, LEONARD M.**

—WOLF, BERNARD S., and ELIASOPH, JOAN: Segmental colitis, Nov., 707

**MARSHALL, V. F.** See **SOUTHWOOD, W. F. W.**

**MARTIN, J. H.**: An estimate of the potential leukaemic factor in the diagnostic use of x rays (ab), July, 154

—and EVANS, ANN: Radiation outside the defined field (ab), Nov., 836

**MARTIN, JOHN A.**: Colon preparation for radiological studies using a new drug (ab), Nov., 813

**MARTIN, PH.** See **MELOT, G. J.**

**MARUYAMA, YOSH.**, PETTET, JOHN R., and GREEN, CHARLES R.: Acquired esophagotracheal fistula secondary to a foreign body in the esophagus (ab), Nov., 810

**MARVIN, JAMES F.** See **GREENSPAN, RICHARD H.**

**MASON, R. M.**, MURRAY, R. S., OATES, J. K., and YOUNG, A. C.: A comparative radiological study of Reiter's disease, rheumatoid arthritis and ankylosing spondylitis (ab), Dec., 949

**MASSOUD, G. E.**, and **AWWAD, H. K.**: Scleroma of the upper air-passages: a clinico-radiological study of 84 cases (ab), Nov., 800

**MASTECTOMY.** See **Breast, cancer**

**MATHIESSEN, FRITZ R.**: Clinical manifestations of primary varicose veins. I. An evaluation of some phlebographic findings in the deep veins (ab), Oct., 609

Tilt phlebography of normal legs (ab), Oct., 648

Tilt phlebography, a reliable method for diagnosing incompetent communicating veins (ab), Sept., 472

**MATTHEWS, LeROY W.** See **SPECTOR, SAMUEL**

**MAXWELL, WALTER T.** See **MARCHETTA, FRANK C.**

**MAYER, EDGAR.**, BLAZSÍK, CHARLES, and RAPPAPORT, ISRAEL: Emphysema and the lungs of the aged: a clinical study. Preliminary report (ab), July, 130

**MECKEL'S DIVERTICULUM.** See **Intestines, diverticula**

**MEDIASTINITIS.** See **Mediastinum**

**EDIESTINUM**

- blood supply
- phlebographic study of mediastinum (ab), M. Demoulin, Nov., 803

**MEDIASTINUM**—*cont.*

**Fibrosis**

- chronic fibrous mediastinitis due to *Histoplasma capsulatum* (histoplasmal mediastinitis); report of 3 cases with different presenting symptoms, George F. Lull, Jr., and Dean F. Winn, Jr., Sept., 367
- idiopathic mediastinal fibrosis (ab), N. R. Barrett, Sept., 467

**Tumors**

- aplasia of a breast after deep roentgen therapy for a mediastinal sarcoma (ab), Ch. M. Gros and R. Keiling, Aug., 325

**MEDICINE**

- See also General Practice
- primer on radiation hazards for physicians (ab), Richard E. Peterson et al, Dec., 964
- radiation hazard as it affects medical practice (ab), H. A. S. van den Brek, Nov., 834

**MEGABULBUS**. See Duodenal, obstruction

**MEINHAUS, JOHN E.** See **KAY, JEROME HAROLD**

**MEINARDUS, K.**: Skull changes in neurofibromatosis of von Recklinghausen (ab), Oct., 638

**MELAMED, A.** See **MARQUARDT, C. R.**

**MELAMINE**

- treatment of retinoblastoma by x-ray and triethylene melamine (ab), A. B. Reese et al, Nov., 822

**MELANIN**

- inflammatory pseudopolypsis of small and large intestines with Peutz-Jeghers syndrome in case of diffuse histoplasmosis (ab), Solomon R. Bersack et al, July, 139

**MELANOMA**. See Tumors, melanoma

**MELICOW, MEYER M.** See **LATTIMER, JOHN K.**

- See **USON, AURELIO C.**

**MELLINKOFF, SHERMAN M.** See **MENA, ISMAEL**

**MELLINS, HARRY Z., KOTTMAYER, PETER, and KIELY, BRIAN**: Radiologic signs of pericardial effusion. An experimental study, July, 9

**MELOT, G. J., POTVLIEGE, R., BRIHAYE, J., and MARTIN, PH.**: Intracranial extension of tumors of the ethmoid, orbit, and rhinopharynx: angiographic study (ab), July, 129

**MELTZER, LAWRENCE E., BOCKMAN, ALBERT A., KANENSON, WILLIAM, and COHEN, ABRAHAM**: The incidence of peptic ulcer among patients on long term prednisone therapy (ab), Aug., 303

**MELVILLE, G. S., Jr.** See **HARTWIG, Q. L.**

**MENA, ISMAEL, BENNETT, LESLIE R., KIVEL, RAYMOND, SCALLON, JOSEPH, and MELLINKOFF, SHERMAN M.**: Determination of cardiopulmonary circulation time by external scintillation counting (ab), Nov., 833

**MENDELSON, ROBERT A.** See **WEINER, ISRAEL H.**

**MENEELY, G. R.** See **HAHN, P. F.**

**MENG, H. C.** See **HAHN, P. F.**

**MENINGES**

- cervicodorsal diverticula of subarachnoid space, Robert Shapiro and Franklin Robinson, Nov., 776
- significance of subdural air in pneumoencephalograms in infants (ab), Robert P. Boudreau and R. M. N. Crosby, July, 127

**Hemorrhage**

- some aspects of subarachnoid hemorrhage—a symposium. I. Clinical and surgical aspects of ruptured intracranial aneurysms (ab), Wylie McKissock, Dec., 937
- some aspects of subarachnoid hemorrhage—a symposium. II. Intracranial aneurysms—pathological aspects (ab), T. Crawford, Dec., 937
- some aspects of subarachnoid hemorrhage—a symposium. III. Accuracy of radiology in demonstrating ruptured intracranial aneurysms (ab), L. V. Perrett and J. W. D. Bull, Dec., 937
- subarachnoid hemorrhage: prognosis when angiography reveals no aneurysm. Report of 138 cases (ab), Olle Höök, Sept., 463

**MENINGOCELE**

- lateral intrathoracic meningocele (ab), Roland Bunner, Nov., 819

**MENISCUS**. See **Knee**

**MENON, A. N. K.** See **NICE, CHARLES M., Jr.**

**MENOPAUSE**

- metabolism of progesterone-4-C<sup>14</sup> in postmenopausal woman with biliary fistula (ab), W. G. Wiest et al, Sept., 490

**MENTAL DEFICIENCY**. See **Feeble-mindedness**

**MENZIES, T.** See **BOOTH, C. C.**

**MERCURY**

- acute mercury vapor poisoning; report of 4 cases with radiographic pathologic correlation, Ching Tseng Teng and James C. Brennan, Sept., 354

**MEREDITH, H. CLARKSON, Jr.**: Subacute thyroiditis (ab), Dec., 959

**MERNER, THOMAS B.**: Acute pancreatitis with peritoneal fat necrosis—roentgen diagnosis (ab), July, 141

**MERRILL, DUANE L., and SAMSON, PAUL C.**: The art and science of bronchography in infants and children (ab), Oct., 640

**MERRITT, A. A.**: Symposium: myelography in the diagnosis of diseases of the spinal canal. Part 3: Prolapse of the intervertebral discs and vascular disease of the spinal canal (ab), Oct., 657

**MESCHAN, I., QUINN, JAMES L., WITCOFSKI, RICHARD L., and HOSICK, THOMAS A.**: The utilization of radioactive zinc and manganese in an effort to visualize the pancreas, July, 62

**MESTEL, A. L.**: Lymphosarcoma of the small intestine in infancy and childhood (ab), Nov., 812

**—TRUSLER, G. A., THOMSON, S. A., and MOES, C. A. F.**: Acute obstruction of small intestine secondary to hematoma in children (ab), Nov., 812

**METABOLISM**. See **Bones, diseases; Iodine and Iodine Compounds; Ovary, hormones; Sodium; etc.**

**METATARSUS**

- experimental epiphysial injury and Freiberg's disease (ab), G. T. F. Braddock, Dec., 952

**METZGER, J., DARY, M., and WACKENHEIM, A.**: Radioanatomic study of the anterior condylar canal (ab), Aug., 287

**MEURK, MARY LOUISE, and CHU, FLORENCE C. H.**: Dose distribution with four radiation technics for carcinoma of the breast, Oct., 607

**MICHAELSON, SOL M.** See **SHIVELY, JAMES N.**

**MICHELSON, ELLIOTT, and SALIK, JULIAN O.**: The vascular pattern of the lung as seen on routine and tomographic studies, Oct., 511

**MICROLITHIASIS**. See **Lungs, calculi**

**MICTURITION**. See **Urination**

**MILL, W. A., GOWING, N. F. C., REEVES, BRIAN, and SMITHERS, D. W.**: Carcinoma of the lingual thyroid treated with radioactive iodine (ab), Nov., 830

**MILLEN, J. W.** See **WOOLLAM, D. H. M.**

**MILLER, ALDEN H.**: H-type tracheoesophageal fistula (ab), Oct., 648

**MILLER, EARL R.**: Cineradiography in practice, Oct., 560

**MILLER, H.** See **BLOMFIELD, G. W.**

**MILLER, MORRIS C.**: Remarks on the clinical and radiologic diagnosis of Meckel's diverticulum. Report of a case (ab), Aug., 306

**MILLER, RONALD S.** See **GALLOWAY, RAYMOND W.**

**MILLER, THEODORE R., and FULLER, LILLIAN M.**: Radiation therapy of carcinoma of the pancreas. Report on 91 cases (ab), Sept., 486

**MILNE, JEAN**. See **CLARKE, K. H.**

**MINOR, B. DONALD**. See **JOHNSON, HENRY C., Jr.**

**MITRAL VALVE**

- angiographic observations in mitral disease with special reference to volume variations in left atrium (ab), Hakan Arvidsson, Aug., 296
- correlation between various assessments of pulmonary arterial pressure in mitral stenosis (ab), J. F. Boyd et al, Aug., 297
- importance of lateral view in evaluation of left ventricular enlargement in rheumatic heart disease, William R. Eyer, David L. Wayne and John E. Rhodenbaugh, July, 56
- rheumatic heart disease associated with atrial septal defect: clinical and pathologic study of 12 cases of Lutembacher's syndrome (ab), J. Espino-Vela, Dec., 942
- some basic principles in diagnosis of chest diseases (Kerley's B lines), Benjamin Felson (Moderator), Felix G. Fleischner, John R. McDonald and Coleman B. Rabin, Nov., 740
- tomography of calcified aortic and mitral valves (ab), Paget Davies and N. L. Bucky, Nov., 805

**MOES, C. A. F.** See **MESTEL, A. L.**

**MOLLISON, P. L., ROBINSON, MARGARET A., and HUNTER, DENISE A.**: Improved method of labelling red cells with radioactive phosphorus (ab), Aug., 323

**MONGOLISM**

- pelvic bones in infantile mongoloidism: roentgenographic features (ab), John Caffey and Steven Ross, July, 144

**MONILIASIS**

- esophageal moniliasis: case with roentgenographic findings (ab), S. A. Kaufman and George Levene, July, 138

**MONTANO, ANDREW**. See **KURNICK, N. B.**

**MOORE, THOMAS C., JUDD, DONALD R., and MOORE, WILL C.**: Carcinoma of the breast in Middletown, U.S.A. (ab), Aug., 317

**MOORE, WILL C.** See **MOORE, THOMAS C.**

**MORELLO, G.** See **LOMBARDI, G.**

**MORIN, Y.** See **LESSARD, R.**

**MORPHINE**

- some radiological observations on effect of morphine sulfate on gastrointestinal tract in man (ab), F. S. Grebbell, Aug., 300

**MORRISON, LEWIS F.** See **SHELINE, GLENN E.**

**MOSCA, LIDIO G.**: Radiologic diagnosis of hypertension of the sphincter of Oddi, and of cystic duct disease (ab), Oct., 653

**MOSELEY, ROBERT D., Jr.**: Diagnosis of tumors of the pancreas with the aid of pneumoretroperitoneal pancreatectomy and splenopancrectomy (ab), Oct., 652

- See **HODGES, PAUL C.**

**MOSS, ARTHUR J., ADAMS, FORREST H., and O'LOUGHLIN, BERNARD J.**: Congenital malformation of the cardiac conduction system (ab), Nov., 804

- See **FINK, BURTON W.**

**MOSS, GERALD:** Symposium: myelography in the diagnosis of diseases of the spinal canal. Part I: The clinical indications for myelographic examination in diseases of the spinal cord and the spinal canal (ab), Oct., 656

**MOSSER, DONN G.** See **LOKEN, MERLE K.**

**MOUTH**  
See also Lips; Tongue  
—plaster casts for radiation therapy of oral carcinoma, Marion F. Magalotti, July, 100

**MUCOCOELE.** See Appendix

**MUCOUS MEMBRANE**  
—effects of prednisolone in treatment of superficial radiation lesions of skin and mucosae (ab), R. L'Abbé et al., July, 156

**MUHR, H.:** Generalized primary calcification of the surface of the articular cartilage, with demonstration of the true joint space (ab), July, 144

**MÜLLER, J. H.:** Successful radioiodine therapy in two cases of metastasizing carcinoma of the thyroid (ab), Oct., 665

**MUELLNER, S. RICHARD:** The voluntary control of micturition in man (ab), Nov., 821

**MULVY, J. H.** See **CROOK, J. C.**

**MUNK, J., and LEDERER, K. T.:** Radiological observations on 33 cases of primary interstitial myocarditis during an outbreak in the Haifa area (ab), Aug., 297

**MUNKNER, TROELZ, PETERSEN, OLAF, and VESTERDAL, JÖRGEN:** Congenital aneurysm of the coronary artery with an arteriovenous fistula (ab), Aug., 294

**MUNRO, D. S.** See **BLOMFIELD, G. W.**

**MUNSLAW, RALPH A., O'NEILL, FRANCIS E., PRICE, RICHARD D., THAGGARD, ALVIN, JR., HARDY, ROBERT C., and WIESNER, JEROME J.:** Cerebral angiography: clinical experience with comparative contrast media (ab), Sept., 463

**MURAKAMI, UJIHIRO, and KAMEYAMA, YOSHIO:** Effects of low-dose x-radiation on the mouse embryo (ab), July, 156

**MURRAY, YUZABURO.** See **KAWANO, MASASHI**

**MURPHY, FRANCIS, and SHILLITO, JOHN, Jr.:** Avoidance of false angiographic localization of the site of internal carotid occlusion (ab), Nov., 800

**MURRAY, M. JOHN.** See **THAL, ALAN P.**

**MURRAY, R. S.** See **MASON, R. M.**

**MURTAGH, FREDERICK, and STAUFFER, HERBERT M.:** The practical value of the internal cerebral vein in the anteroposterior phlebogram (ab), Oct., 639

**MUSCLES**  
—cricopharyngeus  
—spincteric action of cricopharyngeus: radiographic demonstration (ab), A. P. Fuller et al., Nov., 800

**MUSTARD, W. T., and DUVAL, F. W.:** Osteoid osteoma of vertebrae (ab), Dec., 951

**MYELOGRAPHY.** See **Spinal Canal Roentgenography; Spinal intervertebral disks**

**MYELOMA.** See **Tumors, myeloma**

**MYERS, RALPH M.** See **RODMAN, THEODORE**

**MYOCARDIUM.** See **Heart**

**MYOSITIS.** See **Dermatomyositis**

**MYXEDEMA**  
—postoperative myxedema cardiopathy: an unusual instance which developed in immediate postoperative period; case report and review of literature (ab), F. G. Hoffman, Dec., 943

—syndrome of exophthalmos, hypertrophic osteoarthropathy and localized myxedema; review of literature and report of case (ab), Monroe T. Diamond, Nov., 816

N

**NACE, P. F.** See **JAIMET, C. H.**

**NADAS, ALEXANDER S.** See **FYLER, DONALD C.**  
—See **ÖNGLEY, PATRICK A.**

**NARIK, G.:** The method of transfer of labour contractions to the contents of the uterus (ab), Dec., 952

**NASOPHARYNX**  
—cancer  
—intracranial extension of tumors of ethmoid, orbit, and rhinopharynx: angiographic study (ab), G. J. Melot et al., July, 129

—malignant lesions of nasopharynx (ab), Paul W. Scanlon et al., Oct., 663

—tumors  
—leiomyosarcoma (ab), Glen D. Dobben, Aug., 288

**NATAADIDJAJA, E.** See **BEWLEY, D. K.**

**NATHAN, M. H.:** Diagnosis of esophageal varices by a new radiologic method: a preliminary report, Nov., 725

**NATIONAL BUREAU OF STANDARDS**  
—Handbook 69, Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and Water for Occupational Exposure, Aug., 267

—new gamma-ray radioactivity standards, Nov., 790

—new radium solution standards, Aug., 267

**NAVAL MEDICINE**  
—role of photofluorography in Navy tuberculosis control (ab), John F. Chace and E. P. Coffey, Jr., Nov., 801

**NAVICULAR BONES.** See **Scaphoid Bone, Tarsal**

**NEARY, G. J.** See **CROOK, J. C.**

**NECK**  
—pain in the neck; the radiologist's contribution (ab), Frank R. Kinsey, Oct., 640

**CANCER**  
—radical preoperative roentgen therapy in primarily inoperable advanced cancers of head and neck, Franz Buschke and Maurice Galante, Dec., 845

**NECROPSY**  
See also Heart, abnormalities  
—necropsy evaluation of gas contrast roentgen visualization of liver and spleen (ab), Samuel Zelman, Oct., 652

**NECROSIS.** See **Peritonitis; Skin**

**NEGROES**  
—screening urethrocystography of adult Bantu males under manometric control: normal and pathological findings (ab), T. Fiebhardt, Dec., 953

**NELSON, A.** See **HELDE, M.**

**NELSON, J. D.:** The Marfan syndrome, with special reference to congenital enlargement of the spinal canal (ab), Aug., 310

**NELSON, JAMES H., Jr.** See **SAMMONS, BILLY P.**

**NEPHRITIS**  
—acute radiation nephritis in childhood (ab), J. Swanson Beck, Aug., 326

—radiation nephritis: a clinicopathologic correlation of surviving cases (ab), Sheldon R. Cogan and Israel J. Ritter, Aug., 325

—radiation nephritis: fatal case (ab), Bernard F. Schreiner and Robert M. Greendyke, Dec., 962

—radiologic aspects of pleural effusions in nephrotic syndrome and glomerulonephritis in childhood (ab), Cesare Cavina and Gianfranco Vichi, Oct., 643

**NEPHROCALCINOSIS.** See **Kidneys, calcification**

**NEPHROGRAPHY.** See **Kidneys, blood supply**

**NEPHROSIS**  
—radiologic aspects of pleural effusions in nephrotic syndrome and glomerulonephritis in childhood (ab), Cesare Cavina and Gianfranco Vichi, Oct., 643

**NEPHROTOMOGRAPHY.** See **Kidneys, roentgenography**

**NERVES**  
See also **Hemiplegia; Nervous System**  
**HYPOGLOSSAL**  
—radioanatomic study of anterior condylar canal in patient with possible lesion of hypoglossal nerve (ab), J. Metzger et al., Aug., 287

**LUMBAR.** See **Nerves, roots**

—cervicodorsal diverticula of subarachnoid space, Robert Shapiro and Franklin Robinson, Nov., 776

—pain in the neck: the radiologist's contribution (ab), Frank R. Kinsey, Oct., 640

—perineural cysts of lumbar and sacral nerve roots (ab), O. Wiedemann, July, 143

**SACRAL.** See **Nerves, roots**

**NERVOUS SYSTEM**  
See also **Brain; Cerebellum; Nerves; Spinal Cord**  
—observations on neuropathic (Charcot) joints occurring in diabetes mellitus (ab), Julian E. Jacobs, Aug., 310

**TUMORS.** See also **Tumors, neuroblastoma**  
—dermoid and epidermoid tumors in central nervous system of adults (ab), Collins S. MacCarty et al., Dec., 954

**NESBITT, ROBERT E. L., Jr.** See **BRACK, C. BERNARD**

**NETTL, S., STEINHART, L., DITÉ, B., and KROG, M.:** Our experiences with the diagnostic utilization of the deep telangiogram in intracranial space-occupying lesions (ab), Nov., 799

**NEUROBLASTOMA.** See **Tumors, neuroblastoma**

**NEUROFIBROMATOSIS**  
—skull changes in neurofibromatosis of von Recklinghausen (ab), K. Meinardus, Oct., 638

**NEUTRONS**  
—comparative histological study of duodenal damage produced by fission neutrons and  $\text{Co}^{60}$  gamma-rays (ab), S. Leshner and H. H. Vogel, Jr., Oct., 667

—effect of single and multiple doses of  $\text{Co}^{60}$  gamma-radiation and fission neutron radiation on incorporation of  $\text{Fe}^{59}$  into rat erythropoietic system (ab), W. A. Rambach et al., Dec., 966

—quantitative relation of RBE in *Trichosanthis* and average LET of gamma-rays, x-rays, and 1.3-, 2.5-, and 14-Mev fast neutrons (ab), Alan D. Conger et al., Oct., 669

—relative biological effect of 14-Mev neutrons with broad bean root (*Vicia faba*) as a test system (ab), J. F. Spalding et al., Oct., 670

—relative biological effectiveness of fast neutrons and x-rays for life shortening in mice (ab), H. J. Curtis and Katharine Gebhard, July, 158

—relative effectiveness of neutrons of 1.4-Mev and 14-Mev energies and gamma rays in reduction of fertility in male mouse (ab), J. F. Spalding et al., July, 158

**NEWBERRY, G. R.** See **BEWLEY, D. K.**

**NEWSOM, BERNARD D., and KIMELDORF, DONALD J.:** Role of food consumption in the mortality response of irradiated rats subjected to prolonged cold exposure (ab), Nov., 838

**NICE, CHARLES M., Jr., MENON, A. N. K., and RIGLER, LEO G.:** Pulmonary manifestations in collagen diseases (ab), Dec., 941

**NICHOLS, A. F.** See **KEMP, F. H.**

**NICKSON, JAMES J.** See **GLICKSMAN, ARVIN S.**

**NIELSON, HENRY, JR.** See **CORBUS, HOWARD F.**

**NIGOGOSYAN, G.** See **PERESE, D. M.**

**NITRITE**  
—alteration of beta-radiation lesions of skin by cysteine, nitrite, hypoxia, spleen homogenate, and bone-marrow homogenate (ab), A. K. Davis et al, July, 160

**NITROGEN MUSTARDS**  
—combined effect of radiogold and nitrogen mustard and radiogold and certain other compounds on Ehrlich ascites carcinoma (ab), Richard W. Whitehead et al, Oct., 666

—comparison of effects on Shwartzman phenomenon of leukopenia produced by nitrogen mustard and by whole-body irradiation (ab), Douglas E. Johnstone and Joe W. Howland, Aug., 328

**NOELL, WERNER K.** See **BAILY, NORMAN A.**

**HOERBERG, P.** **BERTIL**, and **SAMENIUS, BRUNO**:  
Mucocele of the appendix, with special reference to diagnosis with double contrast method (ab), Sept., 475

**NORDLANDER, SVERKER**, **SALEN, ERNST F.**, and **UNANDER-SCHARIN, LARS**: Discography in low back pain and sciatica. Analysis of 73 operated cases (ab), Nov., 817

**NORMAN, A.** See **GREENFIELD, M. A.**

**NORWOOD, W.** **DAGGETT**: Common sense approach to the problem of genetic hazard due to diagnostic radiology. Report based in part on study of exposures in a small American industrial city (ab), July, 155

**NOSE**  
See also Nasopharynx  
—neuroblastoma originating from olfactory epithelium (esthesioneuroblastoma) (ab), Paul A. Riemenschneider and John T. Prior, Nov., 823

**CANCER**  
—carcinoma of nasal fossa (ab), Robert G. Parker, Nov., 823

**NUCLEAR ENERGY.** See **Radioactivity**

**NUCLEINS**  
—effect of total-body x-radiation from near-threshold to tissue-lethal doses on small-bowel epithelium of rat. II. Changes in nucleic acid and protein synthesis in relation to cell division (ab), Jane N. Toal et al, July, 157

**NUTRITION**  
—effects of kwashiorkor on development of bones of knee (ab), P. R. M. Jones and R. F. A. Dean, Dec., 952

—retarding effect of protracted undernutrition on appearance of postnatal ossification centers in hand and wrist (ab), Samuel Dreizen et al, Oct., 655

**NYHUS, LLOYD M.** See **JESSEPH, JOHN E.**

**O**

**OATES, J. K.** See **MASON, R. M.**

**OBITUARIES**

Blaine, Edward Smith, Aug., 272

Butler, Patrick F., Sept., 459

Collins, James Newton, Aug., 272

Holmes, George Winslow, July, 112

Jones, J. William, Nov., 792

Mahrer, Herbert A., Sept., 459

Schwarz, Gottwald, Aug., 272

Shirley, Amos R., Dec., 929

Sosman, Merrill Clary, Aug., 270

**OCCIPITAL BONE**  
—radioanatomic study of anterior condylar canal (ab), J. Metzger et al, Aug., 287

**ODA, YOSHIO** See **HARPER, PAUL V.**

**ODDUS SPHINCTER.** See **Sphincter Muscles**

**ÖDEN, BO.** See **BELLMAN, SVEN**

**ODONNELL, HAROLD** See **BROWNING, WILLIAM H.**

**ODONTOID PROCESS.** See **Atlas and Axis**

**ODMAN, PER**: Percutaneous selective angiography of the celiac artery (ab), Aug., 298

Percutaneous selective angiography of the superior mesenteric artery (ab), Nov., 809

—See **HELANDER, C. G.**

—and **PHILIPSON, JAN**: Aortic valvular diseases studied by percutaneous thoracic aortography (ab), Sept., 469

**OLD AGE**  
—emphysema and the lungs of the aged: a clinical study; preliminary report (ab), Edgar Mayer et al, July, 130

**OLDENBURG, F. A.** See **CROSS, F. S.**

**OLFACCTORY EPITHELIUM.** See **Nose**

**OLLERENSHAW, ROBERT** See **TUTTON, G. KENNETH**

**OLMSTED, RICHARD W.** See **KIRKPATRICK, JOHN A.**

**O'LOUGHLIN, BERNARD J.** See **BISHOP, HARRY A.**

—See **FALKENBACH, KARL H.**

—See **FINK, BURTON W.**

—See **MC FALL, RUSSELL A.**

—See **MAHONEY, PAUL S.**

—See **MOSS, ARTHUR J.**

—See **ZHEUTLIN, NORMAN**

**ONEILL, FRANCIS E.** See **MUNSLAW, RALPH A.**

**ONGLEY, PATRICK A.**, **NADAS, ALEXANDER S.**, **PAUL, MILTON H.**, **RUDOLPH, ABRAHAM M.**, and **STARKEY, GEORGE W. B.**: Aortic stenosis in infants and children (ab), July, 132

**OPIE, R.** See **BEWLEY, D. K.**

**OPPENHEIMER, M. J.** See **WINTERS, WILLIAM**

—See **YOUNG, BARTON R.**

**OPPENHEIMER, RUDOLF** See **HINMAN, FRANK, JR.**

**OPTIC CANAL**  
—changes in optic canal in tumors of optochiasmatic region (ab), Nicolas Blatt and Mircea Athanasiu, Oct., 638

**OPTIC CHIASM**  
—changes in optic canal in tumors of optochiasmatic region (ab), Nicolas Blatt and Mircea Athanasiu, Oct., 638

**ORBIT**  
—intracranial extension of tumors of ethmoid, orbit, and rhinopharynx: angiographic study (ab), G. J. Melot et al, July, 129

**ORLOFF, THEODORE L.**: Simultaneous cholecystostomy and urography with a new medium "Duografin" (ab), Aug., 315

**ORTHOVOLTAGE THERAPY.** See **Roentgen Therapy**

**OSBORNE, G.** See **PATTISON, J. N.**

**OSSIFICATION** See **Bones, growth**

**OSTEITIS DEFORMANS**  
—Paget's disease of patella (ab), Lawrence Gordon, Oct., 658

**OSTEOARTHRITIS.** See **Hip**

**OSTEOARTROPATHY**  
—syndrome of exophthalmos, hypertrophic osteoarthropathy and localized mixedema; review of literature and report of case (ab), Monroe T. Diamond, Nov., 816

**OSTEOLYSIS**  
—massive osteolysis (ed), Arthur Purdy Stout, Sept., 435

**OSTEOMA.** See **Tumors, osteoma**

**OSTEOMYELITIS.** See **Femur**

**OSTEOPOKILOYSIS.** See **Osteosclerosis**

**OSTEOPOROSIS.** See **Bones, atrophy**

**OSTEOSCLEROSIS**  
—osteopoikilosis; case (ab), R. Uebelhart et al, Aug., 309

**fragills**  
—Albers-Schönberg's disease; 2 new cases (ab), J. Bodart, Sept., 477

**OSTEOTOMY.** See **Spine, ankylosis**

**OSTIUM PRIMUM SYNDROME.** See **Heart, abnormalities**

**O'SULLIVAN, WARD D.** See **CANTLIN, M. L.**

**OVARY**  
—cancer  
—roentgen treatment of granulosa-cell carcinoma (ab), Robert B. Engle, Sept., 466

**hormones**  
—metabolism of progesterone-4-C<sup>14</sup> in postmenopausal woman with biliary fistula (ab), W. G. Wiest et al, Sept., 490

**irradiation**  
—comment on Dr. Ira Kaplan's article on "Genetic Effects in Children and Grandchildren of Women Treated for Infertility and Sterility by Roentgen Therapy," R. R. Newell, Aug., 273; reply of Dr. Kaplan, Nov., 791

**tumors**  
—tumorigenesis in ovaries of mice after x-irradiation (ab), Mary J. Gutherie, Oct., 667

**OWEN, MAUREEN.** See **HINDMARSH, MARGARET**

**OXYACETYLENE.** See **Welders and Welding**

**OXGEN**  
—alteration of beta-radiation lesions of skin by cysteine, nitrite, hypoxia, spleen homogenate, and bone-marrow homogenate (ab), A. K. Davis et al, July, 160

—effect of x-irradiation on antioxidant activity of mammalian tissues (ab), Albert A. Barber and Karl M. Wilbur, Dec., 966

**P**

**PACK, GEORGE T.** See **DARGEON, HAROLD W.**

**PAGET'S DISEASE.** See **Osteitis deformans**

**PAIN** See **Neck**

**PALATE**  
—radiological appearances of soft palate with reference to treatment of cleft palate (ab), Rodney I. Green, Nov., 800

**PALIN, A.** See **TUDWAY, R. C.**

**PALLIUM.** See **Radioactivity, radiopalladium**

**PALMER, P. E. S.**: Giant hypertrophic (tumour simulating) gastritis (ab), Aug., 301

**PANCREAS**  
—percutaneous selective angiography of celiac artery (value in diagnosis of morbid processes of pancreas, liver, and spleen) (ab), Per Odman, Aug., 298

**aberrant**  
—aberrant pancreatic tissue in stomach, Donald R. Rooney, Aug., 241

**abscess**  
—gas in pancreas as sign of abscess (ab), John W. Agnos and R. Brian Holmes, July, 141

**annular**  
—duodenal megalobulbus and annular pancreas (ab), E. E. T. Taylor, Nov., 811

**cancer**  
—implant radiation therapy for carcinoma of pancreas (ab), Paul V. Harper and Katherine Lathrop, Aug., 318

—radiation therapy of carcinoma of pancreas; 91 cases (ab), Theodore R. Miller and Lillian M. Fuller, Sept., 486

**PANCREAS—cont.**

**cysts**

- clinical and surgical aspects of pancreatic pseudocyst; analysis of 58 cases (ab), John M. Waugh and Thomas E. Lynn, Aug., 308
- fibrosis**

  - cystic fibrosis of pancreas: intestinal absorption of fat and fatty acid labeled with  $^{131}\text{I}$  (ab), Keith Reemtsma et al., Oct., 652

- inflammation.** See Pancreatitis
- roentgenography.** See also Pancreas, tumors; Pancreatitis

  - utilization of radioactive zinc and manganese in an effort to visualize the pancreas, I. Meschan, James L. Quinn, Richard L. Witcofski and Thomas A. Hosick, July, 62

- tumors**

  - diagnosis of tumors of pancreas with aid of pneumoperitoneal pancreatography and splenoportography (ab), Robert D. Moseley, Jr., Oct., 652

**PANCREATITIS**

- acute pancreatitis with peritoneal fat necrosis: roentgen diagnosis (ab), Thomas B. Merner, July, 141
- diagnostic value of intravenous cholangiography during acute cholecystitis and acute pancreatitis (ab), Henry C. Johnson, Jr., et al., Nov., 814
- pancreatography in diagnosis of chronic relapsing pancreatitis (ab), A. V. Pollock, Oct., 651

**PANCREATOGRAHY.** See Pancreas; Pancreatitis

**PANNICULITIS**

- unusual manifestations in case of relapsing, nodular, febrile panniculitis (Weber-Christian disease) (ab), Leonard M. Goldberg and Leonard W. Ritzmann, Oct., 658

**PAPILLOMA.** See Tumors, papilloma

**PARAGONIMIASIS**

- pulmonary paragonimiasis: evaluation of roentgen findings in 38 positive sputum patients in an endemic area in Thailand (ab), Romsai Suwanik and Chamlong Haninsu, Dec., 942

**PARK, S. D. SCOTT.** See BOYD, J. F.

**PARKER, ROBERT G.** Carcinoma of the nasal fossa (ab), Nov., 823

**PARKINSON, JOHN E.** The effect of internal emitters on red cell survival in beagle dogs (ab), Nov., 836

**PARTURITION.** See Labor

**PASQUIER, J.** The radiologic aspects of progressive scleroderma (ab), Sept., 473

**PATELLA**

- Paget's disease of patella (ab), Lawrence Gordon, Oct., 658

**PATERSON, D. E., and BAKER, S. J.** The radiological investigation of the small intestine in tropical idiopathic malabsorption (ab), Aug., 303

—See BHATTACHARYA, A. K.

—and HANCOCK, D. M. Duodenal stenosis due to postbulbar ulcer. A comparison of radiological and surgical findings (ab), Oct., 650

**PATTINSON, J. M., and OSBORNE, G.** Benign lesions of the pyloric antrum simulating carcinoma (ab), Nov., 811

**PAUCHANT, M.** See BONTE, G.

**PAUL, LESTER W., and BENGKENDORF, CHARLES.** Roentgen diagnosis of retrograde jejunogastric intussusception, Aug., 234

**PAUL, MILTON H.** See ONGLEY, PATRICE A.

**PAVSEK, EDWARD J.** See PERRYMAN, CHARLES R.

**PAYET, G., CARLOS.** Congenital cystic dilatation of the common duct (ab), July, 141

**PAYEUR, COYT R., KONWALER, BENJAMIN E., and HYDE, LEROY.** Pulmonary alveolar proteinosis: a progressive, diffuse, fatal pulmonary disease (ab), Oct., 643

**PEARLMAN, ALEXANDER.** See BASES, ROBERT

**PEART, W. S., and SUTTON, DAVID.** Renal-vein catheterisation and venography: a new technique (ab), Sept., 471

**PEDICLE SIGN.** See Spine, roentgenography

**PELISSIER, M.** See REBOUL, G.

**PELVIS**

- pelvic lymphography (ab), P. Leenhardt et al., Sept., 484
- abnormalities**

  - Robert's pelvis; case (ab), Ethna W. Little, Sept., 478
  - blood supply**

    - pelvic angiography, with particular reference to its value in extraterrine pregnancy after the fifth month of gestation (ab), K. E. Hodge, Sept., 489
    - roentgenologic interpretation and uses of percutaneous retrograde pelvic arteriography (ab), Billy P. Sammons et al., Aug., 311
    - value of intraosseous venography in tumors of female pelvis (ab), Franz P. Lessmann and Grace M. Waldrup, Oct., 648

  - lymph nodes.** See Lymph Nodes
  - measurement**

    - mid-pelvis in pelvimetry (ab), J. R. Gerace, Dec., 953

- roentgenography.** See also Pelvis, measurement

  - achondroplasia of pelvis and lumbosacral spine: some roentgenographic features (ab), John Caffey, July, 144
  - intrapartum lateral x-ray in conduct of dystocic labors (ab), Leonard M. Roberts et al., Oct., 656

  - pelvic bones in infantile mongoloidism: roentgenographic features (ab), John Caffey and Steven Ross, July, 144
  - tumors**

    - supervoltage radiation for sarcomata of pelvis and lower extremities; preliminary report (ab), G. Edmund Haggart et al., July, 151

**PENDULUM THERAPY.** See Esophagus, cancer

**PENUMBRA.** See Radioactivity, radiocobalt

**PEPTIC ULCER**

  - acute gastric and duodenal ulceration following endotracheal surgery (ab), G. Rotthoff and H. Vieten, Dec., 946
  - combined gastric and duodenal ulceration; survey of 15 cases (ab), R. Mangold, Oct., 650
  - duodenal ulcers in children, with notes on their etiology, John O. Laffer\*, Sept., 374
  - giant duodenal ulcer (ab), John Dawson, Oct., 649
  - incidence of peptic ulcer among patients on long term prednisone therapy (ab), Lawrence E. Meltzer et al., Aug., 303
  - postbulbar duodenal ulceration (ab), Lorna Cooke and Charles F. Hutton, Aug., 302
  - roentgenologic diagnosis of duodenal ulcers (ab), Abercio Arantes Pereira, Aug., 302
  - x-ray manifestations of peptic ulceration during corticosteroid therapy of rheumatoid arthritis (ab), Theodore F. Hilbush and Roger L. Black, Aug., 303
  - surgical therapy**

    - carcinoma of gastric stump after resection for benign peptic ulcer (ab), Ch. Debray et al., Sept., 474
    - duodenal stenosis due to postbulbar ulcer: comparison of radiological and surgical findings (ab), D. E. Patterson and D. M. Hancock, Oct., 650
    - radiation therapy for stoma ulcer occurring after subtotal gastrectomy (ab), Everett D. Kiefer and Magnus I. Smedal, Nov., 825

**PEREIRA, ABÉRCIO ARANTES.** Roentgenologic diagnosis of duodenal ulcers (ab), Aug., 302

**PEREIRA, RUBENS MARCONDES.** See CULVER, GORDON J.

**PERESE, D. M., SLEPIAN, A., and NIGOGOSYAN, G.** Postoperative dissemination of astrocytoma of the spinal cord along the ventricles of the brain. A case report (ab), Nov., 818

**PERICARDITIS**

  - constrictive pericarditis (ab), T. M. D. Gimlette, Nov., 806
  - with effusion**

    - diagnosis of pericardial effusion with intracardiac carbon dioxide, James H. Scatiff, Alfred J. Kummer and Arnold H. Janzen, Dec., 871
    - radiologic signs of pericardial effusion: experimental study, Harry Z. Mellins, Peter Kottmeier and Brian Kiely, July, 9
    - role of angiography in surgical treatment of massive pericardial effusions (ab), Cranston W. Holman and Israel Steinberg, Sept., 469

**PERICARDIUM**

  - See also Pericarditis
  - diverticula**

    - congenital diverticula of pericardium (ab), Stanley C. Fell et al., Nov., 806

**PERITONEUM**

  - acute pancreatitis with peritoneal fat necrosis: roentgen diagnosis (ab), Thomas B. Merner, July, 141
  - collective review: studies of resorption of chromium-51 tagged erythrocytes from peritoneal cavity; absorption of fluids and particulate matter from peritoneal cavity (ab), Donald B. Rochlin et al., Sept., 490

**PERRETT, L. V., and BULL, J. W. D.** Some aspects of subarachnoid haemorrhage—a symposium. III. The accuracy of radiology in demonstrating ruptured intracranial aneurysms (ab), Dec., 937

**PERRY, SEYMOUR, CRADDOCK, CHARLES G., Jr., VENTZKE, LUTZ, CREFALDI, GAETANO, and LAWRENCE, JOHN S.** Rate of production of  $\text{^{131}I}$ -labeled lymphocytes (ab), Dec., 962

**PERRYMAN, CHARLES R., PAVSEK, EDWARD J., and McALLISTER, JOHN D.** Clinical evaluation of radioactive chrome phosphate in the control of malignant pleural and ascitic effusions, Dec., 865

**PERSKY, LESTER.** See FORSYTHE, WILLIAM E.

**PERSSON, F.** See EDLING, N. P. G.

**PETERS, RICHARD M.** See SPRUNT, WILLIAM H.

**PETERSEN, OLAF.** See MUNKNER, TROELS

**PETERSON, RICHARD E., BARON, JULIUS G., KENT, BARTIS M., and EVANS, TITUS C.** A primer on radiation hazards for physicians (ab), Dec., 964

**PETROV, R. V.** See KLEMPARSKAYA, N. N.

**PETTET, JOHN R.** See MARUYAMA, YOSH

**PEUTZ-JEGHERS SYNDROME.** See Intestines, tumors

**PHANTOMS**

  - dose distributions in arc therapy in 200 to 250 kv range: systematic measurements in homogeneous phantoms with beam direction perpendicular to oscillation axis (ab), Olov Dahl and Karl J. Wikterlöf, Nov., 827

**PHARYNX**

  - cinefluorographic study of pharyngeal function related to speech, John A. Kirkpatrick and Richard W. Olmsted, Oct., 557

**PHILIPP, ERNST, and RUMPHORST, KARL:** Results of therapy of cervical carcinoma, 1948-1952, within the scope of therapeutic results of a thirty-year period (ab), July, 150

**PHILIPON, J.:** Study of congenital meniscal malformations by pneumarthrography (ab), Nov., 818

**PHILIPSON, JAN.** See **ODMAN, PER**

**PHILLIPS, LEON A.** See **LANG, ERICH K.**

**PLETHOGRAPHY.** See **Brain, tumors; Extremities, blood supply; Femur, blood supply; Mediastinum, blood supply; Varicose Veins; Veins**

**PHOSPHORUS, RADIOACTIVE.** See **Radioactivity, radiophosphorus**

**PHOTOBIOLOGY.** —Third International Congress of Photobiology, Oct., 621

**PHOTOFLUOROGRAPHY.** See **Roentgen Rays, fluoroscopy; Tuberculosis, Pulmonary, roentgenography**

**PHOTOGRAPHY** —kilovoltage and radiographic effect: investigation leading to a standard x-ray scale (X.V.S.) system of simplified exposures for conventional and automatic radiography, Gerhart S. Schwarz, Nov., 749

—penumbra measurements of supravoltage and cobalt-60 machines by photographic method, Leonard Stanton, Aug., 253

**PHOTOMETRY** —estimation of dry skeletal weight by photometry of roentgenograms (ab), Paul T. Baker and Harald Schrader, July, 149

**PHYSICIANS.** See **Medicine**

**PICK, J. W.** See **MARQUARDT, C. R.**

**PICKARD, C.** See **WATSON, HAMISH**

**PICKER FOUNDATION** —awards in radiological research, Sept., 455

—fellowships, Nov., 790

**DI PIETRO, S.** See **CARNEVALI, G.**

**PINEAL BODY** —effect of rotation of skull on measured position of pineal gland (ab), John W. Agnew and D. G. Wollin, July, 129

**PINSONNEAULT, G.** See **L'ABBE, R.**

**PISCHNOTTE, WILLIAM O.** See **SAMMONS, BILLY P.**

**PITUITARY BODY** —irradiation —destruction of hypophysis with radioactive colloidal chromic phosphate in cancer of prostate (ab), Philip C. Johnson et al., July, 152

—hypophsectomy combined with intrasellar irradiation with yttrium 90; preliminary communication (ab), G. A. Edelstyn et al., Aug., 322

—results of roentgen treatment of acromegaly; a clinical review (ab), Bengt Arner et al., Sept., 485

—screw-implantation of pituitary with yttrium 90 (ab), A. P. M. Forrest et al., Aug., 321

**preparations.** See **Pituitary Preparations**

**tumors** —discussion on pituitary tumors (ab), Harvey Jackson et al., Sept., 484

—visual field changes produced by x-ray treatment of pituitary tumors (ab), Max Chamlan, Aug., 324

**PITUITARY PREPARATIONS** —use of TSH test in diagnosis of thyroid disorders, William McK. Jefferies, Richard P. Levy and John P. Storaasli, Sept., 341

**PLACENTA** —pelvic angiography, with particular reference to its value in intrauterine pregnancy after fifth month of gestation (ab), K. E. Hodge, Sept., 480

**praevia** —isotope localization of placenta in placenta praevia (ab), Donald L. Hutchinson et al., July, 153

—one radiograph to exclude placenta praevia (ab), Albert A. Earn et al., Aug., 311

**roentgenography** —enlargement of placenta as demonstrated by soft-tissue placentography (ab), James W. Ryel and George Jacobson, Sept., 481

**PLACENTOGRAPHY.** See **Placenta**

**PLANIGRAPHY.** See **Body-Section Roentgenography**

**PLASTER OF PARIS.** See **Casts**

**PLASTICS** —radiation dosimetry by transparent plastics (ab), J. W. Boag et al., Nov., 827

**PLATINUM** —dosage tables for linear radium sources filtered by 0.5 and 1.0 mm. of platinum, M. A. Greenfield, M. Fichman and A. Norman, Sept., 418

**PLEURISY** —with effusion. See also **Effusions**

—radiologic aspects of pleural effusions in nephrotic syndrome and glomerulonephritis in childhood (ab), Cesare Cavina and Gianfranco Vichi, Oct., 643

—some basic principles in diagnosis of chest diseases (pleural fluid), Benjamin Felson (Moderator), Felix G. Fleischner, John R. McDonald and Coleman B. Rabin, Nov., 740

**PLUMBAGE.** See **Tuberculosis, Pulmonary, surgical therapy**

**PLUTONIUM** —effect of internal emitters on red cell survival in beagle dogs (ab), John E. Parkinson, Nov., 836

**PNEUMARTHROGRAPHY.** See **Knee**

**PNEUMOCOINIOSIS** —aseptic cavitation of pseudotumors in anthracosilicosis: clinical and radiological study (ab), J. Prignot and R. Van de Velde, Aug., 292

**PNEUMOENCEPHALOGRAPHY.** See **Brain, roentgenography**

**PNEUMOGRAPHY.** See also **Brain, roentgenography; Pneumoperitoneum**

—radiologic possibilities in diagnosis of lumbar aortic lymph node enlargement by means of retroperitoneal air inflation (ab), G. Carnevali and S. Di Pietro, Oct., 66

**PNEUMONIA** —postpneumonic pseudo air cysts in children (ab), K. Schlagler, Aug., 291

—rheumatic pneumonitis. Part II, Report on the clinical and laboratory findings in 23 patients (ab), David Goldring et al., Oct., 642

—varicella pneumonia with prolonged roentgenologic change (ab), Allen G. Brailey, Jr., and Kjeld O. Husby, Aug., 291

**PNEUMONITIS.** See **Pneumonia**

**PNEUMOPERITONEUM** —role of glycography (pneumoperitoneum and hysterosalpingography) in evaluation of infertile woman (ab), Irving F. Stein, Sept., July, 147

**PNEUMOPLANIGRAPHY.** See **Brain, roentgenography**

**POCHIN, E. E.** See **HALMAN, K. E.**

**POSCHL, M.** See **LUDEKE, H.**

**POHL, R.** The origin and diagnosis of alveolar-cell carcinoma of the lung (pulmonary adenomatosis) (ab), Dec., 939

**POIDEVIN, L. O. S., and BOCKNER, V. Y.** A hystero-graphic study of uterus after caesarean section (ab), Aug., 311

**POLLOCK, A. V.** Pancreatography in the diagnosis of chronic relapsing pancreatitis (ab), Oct., 651

**POLONIUM** —accumulation of polonium ( $Po^{210}$ ) by water-living organisms (ab), V. Z. Agranat, Nov., 833

**POLYCYTHEMIA** —effect of anemia and transfusion polycythemia on phosphorus and iron uptake in erythrocyte precursors in rat bone marrow, studied by means of triple tracer technique with  $Po^{210}$ ,  $Fe^{59}$  and  $Cr^{51}$  (ab), Joseph P. Kriss et al., Dec., 962

**POLYPI.** See **Intestines, tumors**

**POLYTOME.** See **Roentgen Rays, apparatus**

**POOL, THOMAS L.** Irradiation cystitis (ab), Aug., 326

**POPOV, S. N., and KARMANOVA, Z. YA.** Chronic antral gastritis as a precancerous condition (ab), Nov., 810

**POPPEL, MAXWELL H.** See **JACOBSON, HAROLD G.**

**PORPHYRIN AND PORPHYRIN COMPOUNDS.** See **Hemoporphyrin**

**PORTAL VEIN** —diagnosis of tumors of pancreas with aid of pneumoperitoneal pancreatography and splenoportography (ab), Robert D. Moseley, Jr., Oct., 652

—intra-oesophageal venography in portal hypertension (ab), Franz P. Lessmann and Robert Schobinger, Dec., 940

**PORTER, HOWARD R.** See **DECKER, HENRY G.**

**PORTILLO, B.** See **ESPINO-VELA, J.**

**POSITION** in **roentgenography.** See **Brain, roentgenography; Gallbladder, roentgenography**

**POSTIRON-SCANNING.** See **Counters and Counting**

**POSTERIOR FOSSA** —iodoventriulography in lesions of posterior fossa (ab), G. Corneli et al., Aug., 286

—posterior fossa arteriovenous aneurysm with occlusion of a vertebral artery (ab), Robert D. Teasdall, July, 129

**POTASSIUM** —studies on exchangeability of sodium and potassium by their isotopes in clinical conditions (ab), J. C. Demanet et al., Sept., 493

**POTVILIEG, R.** See **MELOT, G. J.**

**POURQUIER, H.** See **LEENHARDT, P.**

**POWELL, CLINTON C.** See **CRAMER, LESTER M.**

**POWERS, W. E.** See **HOLTZ, S.**

**POZNANSKI, ANDREW K.** Cyst of the left triangular ligament of the liver, Dec., 896

**PRATT, T. L. C.** Spontaneous dislocation of the atlanto-axial articulation occurring in ankylosing spondylitis and rheumatoid arthritis (ab), Nov., 801

**PREDNISOLONE.** See **Adrenocortical Preparations**

**PREGNANCY** —See also **Fetus; Labor; Pelvis, measurement**

—acute leukemia in infant following excessive intrauterine irradiation (ab), F. W. Gunz et al., Sept., 495

—pelvic angiography, with particular reference to its value in intrauterine pregnancy after fifth month of gestation (ab), K. E. Hodge, Sept., 480

—roentgenologic interpretation and uses of percutaneous retrograde pelvic arteriography (ab), Billy P. Sammons et al., Aug., 311

**PRESSURE** —use of pneu-pressure device for visualizing hiatus hernia (ab), Richard H. Marshak and Arnold Getson, Oct., 654

**PRICE, RICHARD D.** See **MUNSLAW, RALPH A.**

**PRICE, VINCENT E.** See **GREENFIELD, ROBERT E.**

**PRIGNOT, J., and VAN de VELDE, R.**: Aseptic cavitation of pseudotumors in anthracosilicosis: clinical and radiological study (ab), Aug., 292

**PRIOR, JOHN T.** See **RIEMENSCHNEIDER, PAUL A.**

**PRITCHARD, JACK A.** See **SPARR, RICHARD A.**

**PROGESTERONE.** See **Ovary, hormones**

**PROSTATE**

- Cancer**
  - destruction of hypophysis with radioactive colloidal chromic phosphate in cancer of prostate (ab), Philip C. Johnson et al., July, 152
  - new method for handling radioactive gold in treatment of prostatic cancer (ab), William J. Baker et al., July, 152
  - present status of radioactive gold therapy in management of prostatic cancer (ab), R. H. Flocks et al., Nov., 830
  - vasoseminal vesiculography in hypertrophy and carcinoma of prostate (ab), Gunnar W. Vestby, July, 147
- Hypertrophy**
  - vasoseminal vesiculography in hypertrophy and carcinoma of prostate (ab), Gunnar W. Vestby, July, 147
  - views on value of urethrocystography in determining indications for surgery in prostatic hypertrophy (ab), Hans Ekman, Sept., 483

**PROTEINS**

See also **Blood, proteins**

- effect of total-body x-radiation from near-threshold to tissue-lethal doses on small-bowel epithelium of rat. II. Changes in nucleic acid and protein synthesis in relation to cell division (ab), Jane N. Toal et al., July, 157
- pulmonary alveolar proteinosis: a progressive, diffuse, fatal pulmonary disease (ab), Coyt R. Payseur et al., Oct., 643

**PSENNER, L., and SCHÖNBAUER, E.**: Tuberous sclerosis, with particular attention to the roentgenologic aspect (ab), Oct., 662

**PTERYGIUM**

- treatment of pterygium by surgery followed by beta radiation: analysis of 256 cases (ab), Walter Lentino et al., Dec., 959

**PULMONARY ARTERY.** See **Arteries, pulmonary**

**PULMONARY VALVE**

- fluoroscopic sign of pulmonic stenosis (ab), Henry Green, Nov., 808

**PULMONARY VEINS.** See **Veins, pulmonary**

**PYELOGRAPHY**

- pyelographic diagnosis of lesions of renal papillae and calyces in cases of hematuria (ab), Benjamin S. Abeshouse and Julian O. Salik, Sept., 481
- pyelography in renal disease with hypertension: correlation between pyelographic findings and differential renal function studies, Lucy F. Squire and Jorgen U. Schlegel, Dec., 849
- radiation exposure of patient and personnel during urographic procedures (ab), H. S. Weens et al., Nov., 836
- should intravenous pyelography be a routine procedure for children with cryptorchism or hypospadias? (ab), Lester M. Felton, Dec., 954
- spontaneous extravasation during urography (ab), William E. Forsythe et al., Sept., 483
- usefulness of a contrast medium containing an antibacterial agent (Retrografin) for retrograde pyelography (ab), Joseph Bloom and J. F. Richardson, Dec., 954

**PYGOTT, F., and HUTTON, C. F.**: Vertebral arteriography by percutaneous brachial artery catheterisation (ab), Dec., 938

**PYLORUS**

- benign lesions of pyloric antrum simulating carcinoma, with comments on value of gastroscopy in diagnosis of antral lesions (ab), J. N. Pattinson and G. Osborne, Nov., 811
- development of primary pyloric hypertrophy in adults in relation to structure and function of pyloric canal (ab), Stanley C. Skoryna et al., Nov., 811
- prepyloric contractions in certain abnormal conditions (ab), A. D. Keet, Jr., Sept., 473

**PYÖRALA, KALEVI, HEIKEL, PER-ERIK, and HALONEN, PENTTI I.**: Hypoplasia of the aorta: report of a case (ab), Dec., 944

**PYRAH, L. N., and KEATES, P. G.**: The transperitoneal removal of certain vesical diverticula and a radiographic technique for diagnosis (ab), Oct., 659

Q

**QUASTLER, HENRY**: Cell renewal and acute radiation damage, Aug., 161

—See **LEWIS, YEVETTE S.**

**QUILLIAM, R. L.** See **SPITZER, RICHARD**

**QUINN, JAMES L.** See **MESCHAN, I.**

R

**RABAGO Y PARDO, GREGORIO.** See **BREWER, LYMAN A.**, III

**RABIN, COLEMAN B.** See **FELSON, BENJAMIN**

**RABONI, F.**: Syndrome of the cystic duct (ab), Aug., 307

**RABSON, ALAN S.** See **BERSACK, SOLOMON R.**

**RADIATIONS**

See also **Counters and Counting**; **Dosimetry**; **Neutrons**; **Polonium**; **Radioactivity**; **Radiobiology**; **Radium**; **Radon**; **Roentgen Rays**; **Thorium**

- factors influencing incidence of leukemia: special consideration of role of ionizing radiation (ab), E. E. Schwartz and A. C. Upton, Aug., 327
- effects. See also **Radiations, injurious effects**
- biologic effect of cellular structures in normal and irradiated rabbits (ab), N. N. Klemparskaya et al., Nov., 838
- cell renewal and acute radiation damage, Henry Quastler, Aug., 161
- comparison of effects on Shwartzman phenomenon of leukopenia produced by nitrogen mustard and by whole-body irradiation (ab), Douglas E. Johnstone and Joe W. Howland, Aug., 328
- effects of heavy particle irradiation on acute mortality and survival time in mouse (ab), V. P. Bond and O. D. Easterday, Nov., 837
- estimation of nonrecuperable injury caused by ionizing radiation (ab), John S. Krebs et al., Nov., 835
- rate of recovery from radiation damage and its possible relationship to life shortening in mice (ab), John B. Storer, Dec., 965
- short and long term observations concerning the effect of homologous and heterologous cell-free spleen extracts on radiation mortality in mice and guinea-pigs (ab), F. Ellinger, Dec., 965
- species differences in response to high radiation doses (ab), Howard L. Andrews, Sept., 496
- studies with transplantable AK4 mouse leukemia. III. Effect of spleen and marrow shielding on AK4 leukemic implants in homologous strains of irradiated mice (ab), Irene U. Boone et al., Aug., 328
- tolerance of skin grafts to radiation: a study of post-mastectomy irradiated grafts (ab), R. W. Cram et al., Nov., 836

**injurious effects.** See also **Radiations, protection against**; **Radioactivity**; **Roentgen Rays**, **injurious effects**; **Thorium**

- carcinoma of thyroid following irradiation (ab), A. W. G. Goolden, Aug., 325\*
- effects of prednisolone in treatment of superficial radiation lesions of skin and mucosae (ab), R. L'Abbe et al., July, 156
- experimental studies. See **Radiations, effects**
- hazards of ionizing radiation (ab), A. Zuppinger, Sept., 494
- hazards of short-wave radiation (ab), H. R. Schinz, July, 154
- leukemogens (ab), John D. Abbott and A. J. Lea, Sept., 494
- ocular effects of radiation (ab), David G. Cogan, Aug., 324
- primer on radiation hazards for physicians (ab), Richard E. Peterson et al., Dec., 964
- radiation hazard as it affects medical practice (ab), H. A. S. van den Brenk, Nov., 834
- radiation hazards in industry (ab), Gordon C. Smith, Nov., 835
- radiation nephritis: a clinicopathologic correlation of 3 surviving cases (ab), Sheldon R. Cogan and Israel L. Ritter, Aug., 325
- thyroid neoplasms following irradiation (ab), G. M. Wilson et al., Aug., 325
- treatment and care of irradiated skin (ab), Karl-Heinz Kärcher, Sept., 495
- treatment of postirradiation hematopoietic depression in man by the infusion of stored autogenous bone marrow; preliminary observations (ab), N. B. Kurnick et al., Sept., 497

**protection against**

- National Bureau of Standards Handbook 69. Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and Water for Occupational Exposure, Aug., 267
- radiation control at grassroots (ed), Richard H. Chamberlain, Dec., 927

**RADIOACTIVITY**

See also **Polonium**; **Radiations**; **Radium**; **Thorium**

- use of magnetic tape for recording radioactivity, Solomon N. Albert, H. N. Eccleston, Jr., T. Fujita, Charles H. Hunter and Chalam A. Albert, Dec., 923\*
- visualization of internal organs by accentuation scintillation scanning techniques, William J. MacIntyre, Hymer L. Friedell, Godofredo Gomez Crespo and Abbas M. Rejali, Sept., 329

**injurious effects.** See also other subheads under **Radioactivity**

- acute clinical effects of penetrating nuclear radiation (ab), Herbert B. Gerstner, Aug., 327
- gonadal dose in Canada arising from clinical use of unsealed radioactive isotopes (ab), H. E. Johns and R. M. Taylor, Oct., 667
- radioactivity and human skeleton (ab), L. D. Marinelli, Sept., 494

**radioboron**

- effects of heavy particle irradiation on acute mortality and survival time in the mouse (ab), V. P. Bond and O. D. Easterday, Nov., 837

**radiocalcium**

- radiocalcium studies of bone formation rate in human metabolic bone disease (ab), Robert P. Heaney and G. Donald Whedon, Oct., 666

**RADIOACTIVITY—cont.**

**radiocarbon**  
—metabolism of progesterone-4-C<sup>14</sup> in postmenopausal woman with biliary fistula (ab), W. G. Wiest et al., Sept., 490

**radiocesium**  
—attenuation of scattered cesium-137 gamma rays, F. S. Frantz, Jr., and H. O. Wyckoff, Aug., 263  
—calorimetric measurements on a cesium-137 teletherapy unit (ab), Paul N. Goodwin, Nov., 832

**radiochromium.** See also Radioactivity, radiophosphorus  
—collective review: studies of resorption of chromium-51 tagged erythrocytes from peritoneal cavity; absorption of fluids and particulate matter from peritoneal cavity (ab), Donald B. Rochlin et al., Sept., 490  
—effect of anemia and transfusion polycythemia on phosphorus and iron uptake in erythrocyte precursors in rat bone marrow, studied by means of a triple tracer technic with P<sup>32</sup>, Fe<sup>59</sup> and Cr<sup>51</sup> (ab), Joseph P. Kriss et al., Dec., 962  
—effect of internal emitters on red cell survival in beagle dogs (ab), John E. Parkinson, Nov., 836  
—splenectomy in hemolytic anemia: results predicted by body scanning after injection of Cr<sup>51</sup>-tagged red cells (ab), Paul R. McCurdy and Charles E. Rath, Aug., 322  
—studies to detect escape of amniotic fluid into maternal circulation during parturition (ab), Richard A. Sparr and Jack A. Pritchard, Sept., 491

**radiocobalt**  
—comparative histological study of duodenal damage produced by fission neutrons and Co<sup>60</sup> gamma-rays (ab), S. Lesser and H. H. Vogel, Jr., Oct., 667  
—deposition and storage of vitamin B<sub>12</sub> in normal and diseased liver (ab), George B. Jersey Glass, Dec., 961  
—effect of single and multiple doses of Co<sup>60</sup> gamma-radiation and fission neutron radiation on incorporation of Fe<sup>59</sup> into rat erythropoietic system (ab), W. A. Rambach et al., Dec., 966  
—effects of single lethal dose of total-body Co<sup>60</sup> gamma irradiation on calves (ab), George Rosenfeld, July, 157  
—immediate effects of irradiation of elastic tissues with x-rays, radium, and radioactive cobalt (ab), Stefan Jellinek, Sept., 498  
—irradiation of entire body and marrow transplantation: some observations and comments (ab), E. Donnall Thomas et al., Dec., 963  
—lethality in rat as function of dose pattern (ab), Q. L. Hartwig et al., Oct., 668  
—localization scheme for radiation therapy planning with Theratron, H. B. Latourette, C. S. Simons and I. Lampe, Nov., 762  
—penumbra measurements of supervoltage and cobalt-60 machines by photographic method, Leonard Stanton, Aug., 253  
—physical and clinical advantages and limitations of cobalt-60 teletherapy. Part I. Physical factors (ab), Carl B. Baerstrup, Nov., 831  
—physical and clinical advantages and limitations of cobalt-60 teletherapy. Part II. Clinical considerations (ab), Ruth J. Guttmann, Nov., 832  
—precision cobalt-60 unit for fixed field and rotation therapy (ab), H. E. Johns and J. R. Cunningham, Nov., 832  
—primary fibrosarcoma of lung in young child: case treated by lobectomy and cobalt therapy (ab), F. S. Gerbasi et al., Dec., 957  
—pulmonary radiation reaction: a vital-capacity and time-dose study, James R. Gish, E. O. Coates, Lucille A. DuSault and Howard P. Doub, Nov., 679  
—quantitative relation of RBE in Tradescantia and average LET of gamma-rays, x-rays, and 1.3-, 2.5-, and 14.1-Mev fast neutrons (ab), Alan D. Conger et al., Oct., 669  
—relative effectiveness of neutrons of 1.4-Mev and 14-Mev energies and gamma rays in reduction of fertility in male mouse (ab), J. F. Spalding et al., July, 158  
—response of dogs to bilateral whole-body Co<sup>60</sup> irradiation. I. Lethal dose determination (ab), James N. Shively et al., Sept., 493  
—rotation therapy with a cobalt 60 unit. III. Integration of transmitted beam as means of estimating tumor dose (ab), M. A. Bullen and W. R. Inch, Aug., 322  
—simplified method for urinary excretion test of absorption of cobalt-60 labeled vitamin B<sub>12</sub> (ab), Howard F. Corbus and Henry Nielson, Jr., Oct., 666  
—spectral distribution of scattered radiation from a kilocurie cobalt-60 unit (ab), D. V. Cormack and H. E. Johns, July, 153

**radiocopper**  
—positron-scanning with copper-64 in diagnosis of intracranial lesions: partition of copper-64 versenate in, and excretion from, the body (ab), H. J. Bagnall et al., Sept., 488

**radiogallium**  
—hematologic findings in human beings given therapeutic doses of gallium-72 (ab), W. Wolins and V. P. Bond, Aug., 322

**radiogold**  
—combined effect of radiogold and nitrogen mustard and radiogold and certain other compounds on Ehrlich ascites carcinoma (ab), Richard W. Whitehead et al., Oct., 666

—comparison of effects of radioactive internal emitters and x-rays on antibody formation (ab), Paul R. Salerno and Hymer L. Friedell, Sept., 500

—external recording method for estimating hepatic blood flow with use of radiogold (ab), Joseph S. Burkle and Marvin L. Gliedman, Nov., 831

—internal irradiation of dogs with radioactive colloidal gold: synergistic effect of iron (ab), P. F. Hahn and H. C. Meng, Sept., 491

—intravenous radioactive gold in treatment of chronic leukemia: comparison of results with conventional roentgen therapy to splenic area (ab), P. F. Hahn et al., Oct., 665

—irradiation of tumors with gold seeds: simplification of calculation (ab), A. Bercy, Sept., 491

—new method for handling radioactive gold in treatment of prostatic cancer (ab), William J. Baker et al., July, 152

—present status of radioactive gold therapy in management of prostatic cancer (ab), R. H. Flocks et al., Nov., 830

—theoretical study of dosage and geometric distribution of radioactive gold seeds in interstitial radiotherapy (ab), A. Bercy and A. Delferrière, Sept., 491

—treatment of lung tumors with a radioactive gold-carbon suspension; animal experiments (ab), Helmut Ernst et al., Sept., 491

—venographic and scintillographic demonstration of liver metastases (ab), C. G. Helander et al., Oct., 652

**radiiodine.** See also Goiter; Thyroid  
—absorption, transport, and deposition of fat: application of new method for determination of I<sup>131</sup>-lipid activity in dogs and man (ab), David A. Turner, July, 153

—inhalation radiocardiography (using radioactive methyl iodide and radiokrypton) (ab), C. H. Jaimes et al., Oct., 666

—isotope circulation studies in congenital heart disease (ab), Richard H. Greenspan et al., Dec., 961

—isotope localization of placenta in placenta praevia (ab), Donald L. Hutchinson et al., July, 153

—modification of I<sup>131</sup> triolein test of fat absorption utilizing a capsule test meal (ab), J. I. Isley, Jr., et al., Sept., 489

—new test for vesicoureteral reflux: an external technic using radioisotopes (ab), Chester C. Winter, Nov., 820

—physiological studies on beriberi heart disease by injection of radioactive material (ab), R. Lessard et al., Nov., 834

—some clinical aspects of isotope circulation studies, Richard H. Greenspan, Richard G. Lester, James F. Marvin and Kurt Amplatz, Sept., 345

—study of fat absorption utilizing I<sup>131</sup>-labeled corn oil in infants and children with and without steatorrhea (ab), Samuel Spector et al., Oct., 665

—use of radioactive isotopes in study of colonic absorption (ab), J. K. Isley et al., Dec., 961

**radioiron**  
—effect of anemia and transfusion polycythemia on phosphorus and iron uptake in erythrocyte precursors in rat bone marrow, studied by means of a triple tracer technic with P<sup>32</sup>, Fe<sup>59</sup> and Cr<sup>51</sup> (ab), Joseph P. Kriss et al., Dec., 962

—effect of single and multiple doses of Co<sup>60</sup> gamma-radiation and fission neutron radiation on incorporation of Fe<sup>59</sup> into rat erythropoietic system (ab), W. A. Rambach et al., Dec., 966

—effect of x-rays on Fe<sup>59</sup>-labeled granulocytes and lymphocytes of rabbit (ab), Luigi Resegotti, July, 160

—studies on anemia of tumor-bearing animals. I. Distribution of radioiron following injection of labeled erythrocytes (ab), Robert E. Greenfield et al., Sept., 492

—turnover studies with Fe<sup>59</sup> in x-irradiated rat (ab), E. H. Belcher et al., Sept., 492

**radiokrypton**  
—inhalation radiocardiography (using radioactive methyl iodide and radiokrypton) (ab), C. H. Jaimes et al., Oct., 666

**radiolithium**  
—effects of heavy particle irradiation on acute mortality and survival time in mouse (ab), V. P. Bond and O. D. Easterday, Nov., 837

**radiomanganese**  
—utilization of radioactive zinc and manganese in an effort to visualize the pancreas, I. Meschan, James L. Quinn, Richard L. Witcofski and Thomas A. Hosick, July, 62

**radiomercury**  
—new gamma-ray radioactivity standards available, National Bureau of Standards, Nov., 790

**radioniobium**  
—new gamma-ray radioactivity standards available, National Bureau of Standards, Nov., 790

**radiopalladium**  
—palladium 103: a new isotope for interstitial implantation at operation (ab), Paul V. Harper et al., Aug., 322

**radiophosphorus**  
—clinical evaluation of radioactive chrome phosphate in control of malignant pleural and ascitic effusions, Charles R. Perryman, Edward J. Pavsek and John D. McAllister, Dec., 865

—comparison of effects of radioactive internal emitters and x-rays on antibody formation (ab), Paul R. Salerno and Hymer L. Friedell, Sept., 500

**RADIOACTIVITY, radiophosphorus**—*cont.*

- destruction of hypophysis with radioactive colloidal chromic phosphate in cancer of prostate (ab), Philip C. Johnson et al, July, 152
- effect of anemia and transfusion polycythemia on phosphorus and iron uptake in erythrocyte precursors in rat bone marrow, studied by means of a triple tracer technique with  $\text{P}^{32}$ ,  $\text{Fe}^{55}$  and  $\text{Cr}^{51}$  (ab), Joseph P. Kriss et al, Dec., 962
- improved method of labeling red cells with radioactive phosphorus (ab), P. L. Mollison et al, Aug., 323
- life span of red cells in rat and mouse as determined by labeling with  $\text{DP}^{32}$  *in vivo* (ab), L. M. van Putten, July, 154
- rate of production of  $\text{P}^{32}$ -labeled lymphocytes (ab), Seymour Perry et al, Dec., 962
- use of radioactive phosphorus for detection of intraocular tumors (ab), R. C. Tudway and A. Palin, Aug., 321

**radiopotassium**

- study on exchangeability of sodium and potassium by their isotopes in clinical conditions (ab), J. C. Demanet et al, Sept., 493

**radiosodium**

- study on exchangeability of sodium and potassium by their isotopes in clinical conditions (ab), J. C. Demanet et al, Sept., 493
- study on variations of exchangeability of sodium by radiosodium in course of treatment of edema: comparison with balance method (ab), J. C. Demanet et al, Sept., 493

**radiostrontium**

- acute effects of partial-body beta irradiation of mice (ab), J. C. Crook et al, July, 156
- effect of fractionation of beta irradiation on rat skin (ab), Elly M. Jacobsen et al, July, 157
- relative hazards of strontium 90 and radium 226 (ab), Margaret Hindmarsh et al, Aug., 323
- three new gamma-ray radioactivity standards available, National Bureau of Standards, Nov., 790
- transmission of radioactive strontium through food from open water reservoirs into human organism (ab), A. N. Marei et al, Nov., 833
- treatment of pterygium by surgery followed by beta radiation; analysis of 256 cases (ab), Walter Lentino et al, Dec., 959

**radiotantalum**

- tantalum 182 in treatment of bladder tumors (ab), Gösta Jönsson et al, Sept., 492
- radioyttrium**
- beta-mosaic: an adaptable radiation source for superficial radiation therapy (ab), Josef Becker and Kurt E. Scheer, July, 152
- effect of fractionation of beta irradiation on rat skin (ab), Elly M. Jacobsen et al, July, 157
- hypophysectomy combined with intrasellar irradiation with yttrium 90; preliminary communication (ab), G. A. Edelstyn et al, Aug., 322
- screw-implantation of pituitary with yttrium 90 (ab), A. P. M. Forrest et al, Aug., 321

**radiozinc**

- utilization of radioactive zinc and manganese in an effort to visualize pancreas, I. Meschan, James L. Quinn, Richard L. Witcofski and Thomas A. Hosick, July, 62

**RADIOBIOLOGY**

- radiation biology (ed), Henry S. Kaplan, Aug., 268
- RADIOGRAPHY**. See Roentgen Rays, diagnosis; under diseases, organs and regions

**RADIOISOTOPES**. See Radioactivity**RADIOLOGICAL SOCIETIES**

- American Radium Society, July, 114
- American Roentgen Ray Society, Nov., 789
- Buffalo Radiological Society, Sept., 455
- Chicago Roentgen Society, July, 114
- Cleveland Radiological Society, Nov., 789
- Colorado Radiological Society, Dec., 929
- East Tennessee Radiological Society, Dec., 929
- Florida Radiological Society, July, 114
- Florida West Coast Radiological Society, Dec., 929
- Georgia Radiological Society, Aug., 274
- Indiana Roentgen Society, July, 114
- Kings County Radiological Society, Aug., 274
- Los Angeles Radiological Society, Sept., 455; midwinter conference, Dec., 929
- Maine Radiological Society, Sept., 455
- Maryland Radiological Society, Aug., 274
- Memphis Roentgen Society, Aug., 274
- Milwaukee Roentgen Ray Society, Nov., 789
- Montana Radiological Society, Nov., 789
- Montreal Radiological Study Club, Nov., 789
- Nebraska Radiological Society, Dec., 929
- New England Roentgen Ray Society, July, 114
- New York Roentgen Society, Aug., 274
- North Carolina Radiological Society, Nov., 789
- Northeastern New York Radiological Society, July, 114
- Ohio State Radiological Society, Sept., 455
- Oklahoma State Radiological Society, July, 114
- Oregon Radiological Society, Oct., 621
- Pacific Northwest Radiological Society, July, 114
- Pennsylvania Radiological Society, July, 115
- Philadelphia Roentgen Ray Society, July, 115
- Pittsburgh Roentgen Society, Aug., 274

**Radiological Society of Hawaii**, Aug., 274**Radiological Society of New Jersey**, July, 114**Rocky Mountain Radiological Society**, Nov., 789**Secretaries and meeting dates**, July, 119; Oct., 630**Section on Radiology of Medical Society of District of Columbia**, Sept., 455**Sociedad Venezolana de Radiología**, Aug., 274**West Virginia Radiological Society**, Oct., 621**Westchester (New York) Radiological Society**, Sept., 455**Wisconsin Radiological Society**, Nov., 789**RADIOLOGICAL SOCIETY OF NORTH AMERICA****forty-fifth annual meeting****(ed)**, Laurence L. Robbins, Sept., 434**commercial exhibits**, Oct., 624**preliminary program**, Sept., 437**refreshers courses**: postgraduate instruction, Sept., 440**RADIOLOGY (journal)****Cumulative Index IV (ed)**, Oct., 620**RADIOLOGY AND RADIOLOGISTS****—progress in patient care in radiology**, John D. Reeves, Sept., 779**RADIOPRÉSISTANCE**. See Roentgen Rays, effects**RADIOTHERAPY****See also Radioactivity; Radium; Roentgen Therapy; under diseases, organs and regions; etc.****—method for construction of isodose charts from minimum experiments data (ab), E. Ann Evans, Nov., 828****—note concerning skin marker for use in radiation therapy**, Milford D. Schulz, Oct., 621**—simplified method of treatment planning**, Lucille A. Da Sault, July, 85**—transverse laminography: the third dimension in body-section roentgenography: applications in radiation therapy (ab)**, Bernard Roswit et al, Dec., 955**RADIUM****See also Radiations; Radon****—dosage tables for linear radium sources filtered by 0.5 and 1.0 mm. of platinum**, M. A. Greenfield, M. Fichman and A. Norman, Sept., 418**—new radium solution standards**, National Bureau of Standards, Aug., 267**effects**. See also Radiations, effects; Radium, injurious effects**—effect of internal emitters on red cell survival in beagle dogs (ab)**, John E. Parkinson, Nov., 836**—immediate effects of irradiation of elastic tissues with x-rays, radium, and radioactive cobalt (ab)**, Stefan Jellinek, Sept., 498**injurious effects****—relative hazards of strontium 90 and radium 226 (ab)**, Margaret Hindmarsh et al, Aug., 323**—radioactivity and human skeleton (ab)**, L. D. Marinelli, Sept., 494**—radium poisoning; 2 cases (ab)**, G. M. Ardran and F. H. Kemp, Sept., 495**—where are the cases of radium poisoning? A plea for assistance (ab)**, Samuel D. Clark, Sept., 495**therapy**. See Radiotherapy; Uterus; cancer; etc.**RADIUS****—traumatic dislocation of radial head as isolated lesion in children; report of 1 case with special regard to roentgen diagnosis (ab)**, Gunnar Stören, Nov., 818**RADON****—treatment of pterygium by surgery followed by beta radiation; analysis of 256 cases (ab)**, Walter Lentino et al, Dec., 959**RAILE, RICHARD B.** See SWAIMAN, KENNETH F.**RAMBACH, W. A., COOPER, J. A. D., ALT, H. L., VOGEL, H. H., JR., CLARK, J. W., and JORDAN, D. L.** The effect of single and multiple doses of  $\text{Co}^{60}$  gamma-radiation and fission neutron radiation on the incorporation of  $\text{Fe}^{55}$  into the rat erythropoietic system (ab), Dec., 966**RAMON GOVINDA**. See LOWREY, GEORGE H.**RAMSEY, GEORGE H.** See CAMPETI, FRANK L.**RANDOLPH, M. L.** See CONGER, ALAN D.**RAPPAPORT, ISRAEL**. See MAYER, EDGAR**RATH, CHARLES E.** See McCURDY, PAUL R.**RAVITCH, MARK M.** Intussusception in infancy and childhood. An analysis of seventy-seven cases treated by barium enema (ab), Sept., 474**RAWLINGS, W. J.** The cervical canal and abortion (ab), Aug., 312**RAWSON, E. G.** See CORMACK, D. V.**RAWSON, RULON W.** See GLICKSMAN, ARVIN S.**RBE**. See Neutrons; Roentgen Rays**REBOUL, G., PELISSIER, M., and BELTRANDO, L.** A case of sponge kidney (ab), Sept., 482**RECKLINGHAUSEN'S NEUROFIBROMATOSIS**. See Neurofibromatosis**RECTUM****—radiographic features of rectosigmoid endometriosis (ab)**, George J. Culver et al, Oct., 651**REED, D. CRAMER**. See BROWNING, WILLIAM H.**REED, FRANKLIN E.** See WOLLMAN, SEYMOUR H.**REEMTSMA, KEITH**, di SANT'AGNESE, PAUL A., MALM, JAMES R., and BARKER, HAROLD G.**Cystic fibrosis of the pancreas: intestinal absorption of fat and fatty acid labeled with  $\text{I}^{131}$  (ab)**, Oct., 652**REESE, A. B., HYMAN, G. A., TAPLEY, NORAH M., and FORREST, A. W.** The treatment of retinoblastoma by x-ray and triethylene melamine (ab), Nov., 822

**REEVES, BRIAN.** See **MILL, W. A.**

**REEVES, JOHN D.**: Progressive patient care in radiology, Nov., 779

**REEVES, R. J.**: Treatment of hemangioma of infants and young children (ab), Nov., 823

—See **ISLEY, J. K., Jr.**

—**SANDERS, A. P.**, **ISLEY, J. K., Jr.**, **SHARPE, K. W.**, and **BAYLIN, G. J.**: Fat absorption from the human gastrointestinal tract in patients undergoing radiation therapy, Sept., 398

**DEL REGATO, J. A.**, and **SALA, J. M.**: The treatment of carcinoma of the lower lip, Dec., 839

**REICH, STANLEY B.** See **CULLINER, MORRIS M.**

**REID, CYPRIAN B.** See **ROSSET, BERNARD**

**REID, JAMES C.** See **TOAL, JANE, NICOLET**

**REISS, H. E.**, and **GROSSMANN, MARIA E.**: Experience with new contrast media for hysterosalpingography (ab), Nov., 819

**REITER'S DISEASE** —comparative radiological study of Reiter's disease, rheumatoid arthritis and ankylosing spondylitis (ab), R. M. Mason et al, Dec., 949

**REJALI, ABBAS M.** See **MCINTYRE, WILLIAM J.**

**RELATIVE BIOLOGICAL EFFECTIVENESS.** See **Neutrons; Roentgen Rays**

**RENDU-OSLER-WEBER DISEASE.** See **Telangiectasis**

**RENE, L.** See **LE MELLETIER, J.**

**RENOGRAFIN.** See **Hip, roentgenography**

**RENogram.** See **Kidneys, calculi**

**RESEARCH** —operations research and optimal radiology (ed), Steven E. Ross, Oct., 618

**RESEGOTTI, LUIGI.** Effect of x-rays on  $Fe^{59}$ -labeled granulocytes and lymphocytes of the rabbit (ab), July, 160

**RESPIRATION** —meaning of gas bubble projected above level of diaphragm (ab), E. Koppenstein, Dec., 946

**RESPIRATORY TRACT** See also **Bronchi**; **Lungs**; **Nasopharynx**; etc. —relationship of cardiac silhouette to altered respiratory dynamics in congenital heart disease in infants, Lawrence A. Davis and Margaret Vermillion, July, 49

—scleroma of upper air passages: clinicoradiological study of 84 cases (ab), G. E. Massoud and H. K. Awwad, Nov., 800

**RETICULOENDOTHELIAL SYSTEM** See also **Bones**, **marrow**; **Liver**; **Spleen** —roentgen therapy in Hand-Schüller-Christian and related diseases (ab), Bertel Jørgsholm, Sept., 487

**RETINA** —relative biological effectiveness of various qualities of radiation as determined by the electroretinogram (ab), Norman A. Baily and Werner K. Noell, Sept., 498

—treatment of retinoblastoma by x-ray and triethylene melamine (ab), A. B. Reese et al, Nov., 822

**RETINOBLASTOMA.** See **Retina**

**RETROGRAFIN.** See **Pneumography**

**RETROPERITONEUM.** See **Abdomen**; **Pneumography**

**REYNOLDS, JACK.** See **CHAPMAN, CARLETON B.**

**RHEUMATIC FEVER** —importance of lateral view in evaluation of left ventricular enlargement in rheumatic heart disease, William R. Eyler, David L. Wayne and John E. Rhodenbaugh, July, 56

—rheumatic heart disease associated with atrial septal defect: clinical and pathologic study of 12 cases of Lutembacher's syndrome (ab), J. Espino-Vela, Dec., 942

—rheumatic pneumonitis. Part II. Report on clinical and laboratory findings in 23 patients (ab), David Goldring et al, Oct., 642

**RHINOPHARYNX.** See **Nasopharynx**

**RHODENBAUGH, JOHN E.** See **EYLER, WILLIAM R.**

**RIBS** —malformation of costal cartilages (ab), E. Fischer, July, 130

**RICHARDS, L. STEPHEN**, and **THAL, ALAN P.**: Phasic dye injection control system for coronary arteriography in the human (ab), Oct., 646

—See **THAL, ALAN P.**

**RICHARDSON, J. F.** See **BLOOM, JOSEPH**

**RICHMOND, J. JACKSON.** See **JACKSON, HARVEY**

**RIEGLER, HENRY C.** See **MARCHETTA, FRANK C.**

**RIEMENSCHNEIDER, PAUL A.**, and **PRIOR, JOHN T.**: Neuroblastoma originating from olfactory epithelium (esthesioneuroblastoma) (ab), Nov., 823

**RIGLER, LEO G.** See **NICE, CHARLES M., Jr.**

**RING, P. A.**: Congenital short femur. Simple femoral hypoplasia (ab), Dec., 951

**RITTER, ISRAEL I.** See **COGAN, SHELDON R.**

**RITZ, VICTOR H.**: Design of free-air ionization chambers for the soft x-ray region (20-100 kv), Dec., 911

**RITZMANN, LEONARD W.** See **GOLDBERG, LEONARD M.**

**ROBERT'S PELVIS.** See **Pelvis**

**ROBERTS, LEONARD M.**, **SQUIRE, JACK J.**, **GUTTMACHER, ALAN F.**, and **MARSHAK, RICHARD**: Intrapartum lateral x-ray in the conduct of dystocic labors (ab), Oct., 656

**ROBERTSON, C. W.**, and **WATSON, G.**: Precise measurements of focal areas in diagnostic x-ray tubes and their applications in tube development (ab), July, 148

**ROBINSON, FRANKLIN.** See **SHAPIRO, ROBERT**

**ROBINSON, MARGARET A.** See **MOLLISON, P. L.**

**ROBINSON, R. G.**: Local bulging of the skull and external hydrocephalus due to cerebral agenesis (ab), Oct., 638

**ROCHES, P.** See **DEBRAY, CH.**

**ROCHLIN, DONALD B.**, **ZILL, HARRY**, and **BLAKEMORE, WILLIAM S.**: Collective review: studies of the resorption of chromium-51 tagged erythrocytes from the peritoneal cavity; the absorption of fluids and particulate matter from the peritoneal cavity (ab), Sept., 490

**ROCKOFF, S. DAVID.** See **CHACE, JOHN F.**

**RODGERS, H. W.** See **EDELSTYN, G. A.**

**RODMAN, THEODORE**, **FUNDERBURK, EUGENE E., Jr.**, and **MYERSON, RALPH M.**: Sarcoidosis with vertebral involvement (ab), Nov., 817

**ROEDAL, ROBERT.** See **IRONSIDE, WILLIAM M. S.**

**RÖHL, LARS.** See **JÖNSSON, GÖSTA**

**RÖMHELD SYNDROME.** See **Stomach, roentgenography**

**ROENTGEN RAYS** See also **Body-Section Roentgenography**; **Cineroentgenography**; **Kymography**; **Radiations**; **Radiotherapy**; **Roentgen Therapy**

**apparatus.** See also **Cineroentgenography**; **Roentgen Rays**, **fluoroscopy**; **Roentgen Rays**, **protection against**

—apparatus for remote injection in radiodiagnostic procedures (ab), D. J. Tibbs and W. G. Leslie, Aug., 315

—roentgen tube with bifocal rotating cathode for production of convergent beams (ab), Mario Lenzi et al, Aug., 320

—serial tunnel for radiography during operations (ab), Eric Samuel, Dec., 956

—simple device for obtaining lateral acetabular views of hip in infants, Donald B. Darling, Sept., 432

—tomography of temporal bone with polytome (ab), Ole Tarp, Dec., 938

—tubes. See also **Roentgen Rays**, **technic**

—use of prone-pressure device for visualizing hiatus hernia (ab), Richard H. Marshall and Arnold Gerson, Oct., 654

**diagnosis.** See also **Roentgen Rays**, **injurious effects**; **Roentgen Rays**, **protection against**

—adaptation of air chutes to roentgen diagnostic departments, Roy R. Greening and Ralph Lovelidge, Sept., 430

—kilovoltage and radiographic effect: investigation leading to a standard x-ray value scale (X.V.S.) of simplified exposures for conventional and automatic radiography, Gerhart S. Schwarz, Nov., 749

—operations research and optimal radiology (ed), Steven E. Ross, Oct., 618

—quantitative aspects of television techniques in diagnostic radiology (ab), G. A. Hay, Sept., 483

—ultra-short (millisecond) timing in roentgen diagnostic procedures including angiography: comparison of dynapulse and impulse timing (ab), Barton R. Young et al, Nov., 804

**effects.** See also **Radiations**, **effects**; **Roentgen Rays**, **injurious effects**

—acquired radioresistance: review of literature and report of a confirmatory experiment (ab), Michael P. Dacquisto, Dec., 965

—comparison of effects of radioactive internal emitters and x-rays on antibody formation (ab), Paul R. Salerno and Hymer L. Friedell, Sept., 500

—compatibility factors influencing acceptance of rat bone marrow graft by irradiated mouse (ab), J. W. Hollingsworth, Oct., 668

—early gastrointestinal response in rat exposed to whole-body x-irradiation (ab), D. G. Baker and C. G. Hunter, Nov., 837

—effect of chemical protection and bone marrow treatment on radiation injury in mice (ab), Paul Ursu et al, July, 159

—effect of combined irradiation and chemotherapy on cancer growth, with special reference to studies with folic acid analogues, Merle K. Loken, Young S. Kim, Donn G. Mosser and James F. Marvin, Aug., 166

—effect of irradiation on antioxidant activity of mammalian tissues (ab), Albert A. Barber and Karl M. Wilbur, Dec., 966

—effect of total-body radiation from near-threshold to tissue-lethal doses on small-bowel epithelium of rat. I. Changes in morphology and rate of cell division in relation to time and dose (ab), R. Bland Williams et al, July, 156

—effect of total-body radiation from near-threshold to tissue-lethal doses on small-bowel epithelium of rat. II. Changes in nucleic acid and protein synthesis in relation to cell division (ab), Jane N. Toal et al, July, 157

—effect of x-rays on  $Fe^{59}$ -labeled granulocytes and lymphocytes of rabbit (ab), Luigi Resegotti, July, 160

—effects of chemotherapy and irradiation therapy on differentiation of experimental tumors (ab), Nathan B. Friedman and Eileen Drutz, Oct., 668

—effects of low-dose radiation on mouse embryo (ab), Ujihiro Murakami and Yoshiro Kameyama, July, 156

—endotoxin treatment and x-irradiation in mice bearing transplanted tumors (ab), Joanne W. Hollcroft and Willie W. Smith, July, 159

**ROENTGEN RAYS, effects—cont.**

- fat absorption from human gastrointestinal tract in patients undergoing radiation therapy, R. J. Reeves, A. P. Sanders, J. K. Isley, K. W. Sharpe and G. J. Baylin, Sept., 398
- growth of primate and nonprimate tissue culture cell lines in x-irradiated and cortisone-treated rats (ab), Lewis L. Coriell et al., Oct., 669
- immediate effects of irradiation of elastic tissues with x-rays, radium, and radioactive cobalt (ab), Stefan Jellinek, Sept., 398
- immunogenetic studies on irradiated mice treated with homologous hematopoietic cells (ab), Michael Feldman and David Yaffe, Sept., 500
- increase in tolerance in mice by field-fractionated (sieve) irradiation (ab), Masatoshi Sakka and Rikisaburo Kamaia, July, 158
- influence of cortisone on teratogenic activity of x-radiation (ab), D. H. M. Woollam et al., Nov., 838
- lethal whole-body irradiation: some experimental issues (ab), Peter Ilbery, Oct., 667
- lymphatic tissue changes in lethally irradiated mice given spleen cells intravenously (ab), C. C. Congdon et al., July, 160
- modification of x-radiation lethality by autologous marrow infusion in dogs (ab), Edward L. Alpen and S. J. Baum, Oct., 669
- potentiation of x-ray effects by actinomycin D, Giulio J. D'Angio, Sidney Farber and Charlotte L. Maddock, Aug., 175
- quantitative relation of RBE in *Tradescantia* and average LET of gamma-rays, x-rays, and 1.3-, 2.5-, and 14.1-Mev fast neutrons (ab), Alan D. Conger et al., Oct., 669
- radiation dose measurements and leukocyte count in rabbits (ab), H. Helde et al., Sept., 498
- relative biological effectiveness of fast neutrons and x-rays for life shortening in mice (ab), H. J. Curtis and Katharine Gebhard, July, 158
- relative biological effectiveness of 4-Mev and 200-kvp x-rays, determined by the LD 50 of the 4-day-old chick embryo (ab), Robert F. Kallman et al., July, 158
- relative biological effectiveness of various qualities of radiation as determined by the electroretinogram (ab), Norman A. Baily and Werner K. Noell, Sept., 498
- response of cosinophils to total-body x-radiation of monkey (ab), Earl Eldred, Dec., 965
- role of bile secretion in gastrointestinal radiation syndrome (ab), Kenneth L. Jackson and Cecil Entenman, Nov., 838
- role of food consumption in mortality response of irradiated rats subjected to prolonged cold exposure (ab), Bernard D. Newsom and Donald J. Kimeldorf, Nov., 838
- supportive therapy to animals exposed to whole-body irradiation (ab), Creighton A. Hardin et al., Aug., 328
- time-dose relationship and morphology of delayed radiation lesions of brain in rabbits (ab), Niels O. Berg and Martin Lindgren, Sept., 499
- total-body x-irradiation and splenectomy in guinea-pigs, Pietro de Franciscis and Emilio Scanziani, Sept., 424
- treatment of mouse lymphosarcoma by total-body x-irradiation and by injection of bone marrow and lymph-node cells (ab), M. J. de Vries and O. Vos, Nov., 837
- tumorigenesis in ovaries of mice after irradiation (ab), Max J. Gutierrez, Oct., 667
- turnover studies with  $^{57}\text{Fe}$  in x-irradiated rat (ab), E. H. Belcher et al., Sept., 492
- ultraviolet microscopy of irradiated intestine (ab), Yvette S. Lewis et al., Sept., 496
- visual field changes produced by x-ray treatment of pituitary tumors (ab), Bax Chamlia, Aug., 324
- films.** See *Roentgenograms*
- fluoroscopy.** See also *Cineuroentgenography*; *Esophagus, motility*; *Pulmonary Valve*; *Roentgen Rays, injurious effects*, etc.
- improvement of diagnostic value of photofluorographic films by electronic means; preliminary report, Myron Forman, Anthony B. Borden and J. Gershon-Cohen, Nov., 754
- isolated fluoroscopy: an evaluation (ab), Robert S. Sherman and William G. Cahan, July, 148
- movements of common bile duct in man: studies with image intensifiers (ab), W. Bennett and R. Shields, Sept., 475
- selective cineangiocardiology with image intensification (ab), Hamish Watson et al., Aug., 299
- television pick-up tubes for x-ray screen intensification (ab), G. B. Banks, Sept., 484
- injurious effects.** See also *Radiations, injurious effects*; *Roentgen Rays, protection against*
- acute radiation nephritis in childhood (ab), J. Swanson Beck, Aug., 326
- aplasia of a breast after deep roentgen therapy for a mediastinal sarcoma (ab), Ch. M. Gron and R. Keeling, Aug., 325
- burn following accidental exposure to high-energy radiation (ab), Lester M. Cramer et al., Dec., 963
- comment on Dr. Ira Kaplan's article on "Genetic Effects in Children and Grandchildren of Women Treated For Infertility and Sterility by Roentgen Therapy" (letter to editor), R. R. Newell, Aug., 275; reply by Dr. Kaplan, Nov., 791
- common sense approach to problem of genetic hazard due to diagnostic radiology: report based in part on study of exposures in small American industrial city (ab), W. Daggett Norwood, July, 155
- estimate of potential leukemogenic factor in diagnostic use of x-rays (ab), J. H. Martin, July, 154
- experimental studies.** See *Roentgen Rays, effects*
- hypertension following x-irradiation of kidneys (ab), Clifford Wilson et al., Aug., 326
- irradiation cystitis (ab), Thomas L. Pool, Aug., 326
- limited survey of radiation exposure from medical fluoroscopes, Robert O. Gorson, Jesse Lieberman and Marvin Green, Dec., 898
- modification of late radiation injury with L-triiodothyronine, Arvin S. Glickman, Rulon W. Rawson and James J. Nickson, Aug., 178
- pulmonary radiation reaction: a vital-capacity and time-dose study, James R. Gish, E. O. Coates, Lucille A. DuSault and Howard P. Doub, Nov., 679
- radiation exposure of patient and personnel during urographic procedures (ab), H. S. Weens et al., Nov., 836
- radiation injury and marrow replacement: factors affecting survival of the host and the homograft (ab), Joseph W. Ferrebee and E. Donnell Thomas, Sept., 497
- radiation nephritis: fatal case (ab), Bernard F. Schreiner and Robert M. Greendyke, Dec., 962
- radiation outside the defined field (ab), J. H. Martin and Ann Evans, Nov., 836
- physics.** See also *Roentgen Therapy*
- design of free-air ionization chambers for the soft x-ray region (20-100 kvp), Victor H. Ritz, Dec., 911
- determination of half-value layer, E. Dale Trout, John P. Kelley and Arthur C. Lucas, July, 107
- spectral distributions of 280 kvp x-rays (ab), D. V. Cormack et al., Aug., 320
- protection against**
- automatic dodging of x-ray exposures to reduce the dose and increase the information (ab), Bertil Jacobson, Sept., 499
- half a century of progress in radiodiagnostic protection (ab), J. A. Bloomfield, Dec., 964
- practical radiation protection (ab), Adrian Johnson, Nov., 836
- precautions in medical radiology (ab), Raymond R. Lanier, July, 155
- radiation dose reduction in dental roentgenography (ab), Lewis E. Ester et al., Oct., 670
- radiation hazards (three-cornered film) (letter to editor), R. R. Newell, Nov., 791
- reducing gonad irradiation in pediatric diagnosis (ab), Harry A. Bishop et al., Dec., 964
- simple protection device for urologic units (ab), Joseph E. Whitley, Aug., 327
- wear and tear on spine: contribution to reduction of radiation to patient (ab), K. Hohl, Oct., 670
- technics.** See also *Body-Section Roentgenography*; *Kymography*; *Pneumography*; *Pyelography*; *Roentgen Therapy*; etc.
- focal spot sizes (ab), F. H. Kemp and A. F. Nichols, July, 148
- precise measurements of focal areas in diagnostic x-ray tubes and their applications in tube development (ab), C. W. Robertson and G. Watson, July, 148
- some consideration of focal spot sizes (ab), A. Beetstone and G. Thurmer, July, 149
- therapy.** See *Roentgen Therapy*
- ROENTGEN THERAPY**
- See *Cancer, radiotherapy*; *Radiotherapy*; *Roentgen Rays, effects*; *Roentgen Rays, injurious effects*; *under diseases, organs and regions*
- orthovoltage therapy: Is there still a need for it? (ab), Sol R. Baker, Oct., 663
- dosage.** See also *Dosimetry*
- dose distributions in arc therapy in the 200 to 250 kv range: systematic measurements in homogeneous phantoms with beam direction perpendicular to oscillation axis (ab), Olov Dahl and Karl J. Wikterlöf, Nov., 827
- integral doses at 200 kv and 8 Mev (ab), D. K. Bewley et al., Dec., 959
- radiation dosimetry by transparent plastics (ab), J. W. Boag et al., Nov., 827
- grid therapy.** See *Cancer, radiotherapy*; *Roentgen Rays, effects*; *Tumors, lymphoma*
- high-voltage.** See also *Bladder, cancer*; *Pelvis, tumors*
- penumbra measurements of supervoltage and cobalt-60 machines by photographic method, Leonard Stanton, Aug., 253
- pendulum therapy.** See *Esophagus, cancer*
- rotation therapy.** See *Bladder, cancer*
- sieve therapy.** See *Roentgen Rays, effects*; *Tumors, lymphoma*
- ROENTGENGRAMS**
- adaptation of air chutes to roentgen diagnostic departments, Roy R. Greening and Ralph Lovelidge, Sept., 430
- estimation of dry skeletal weight by photometry of roentgenograms (ab), Paul T. Baker and Harald Schraer, July, 149
- radiation hazards (three-cornered film) (letter to editor), R. R. Newell, Nov., 791
- ROGERS, BETTY S.** See *BOONE, IRENE U.*

**R**  
 RAZZAK, JAMES V., Jr. See CHANG, C. H. (JOSEPH)  
 ROHRER, R. H. See WEENS, H. S.  
 ROKITANSKY-ASCHOFF SINUSES. See Gallbladder  
 ROLLESTON, G. L. See GUNZ, F. W.  
 ROMINGER, C. JULES. See CANTLIN, M. L.  
 ROONEY, DONALD R.: Aberrant pancreatic tissue in the stomach, Aug., 241  
 ROSE, J. DUDFIELD: Biliary vesicular stasis (ab), Aug., 307  
 Serial cholecystography: A means of preoperative diagnosis of biliary dyskinesia (ab), Nov., 813  
 ROSENBERG, LEE S., and FINE, ARCHIE: Fatal venous intravasation of barium during a barium enema, Nov., 771  
 ROSENBERG, SAUL A., DIAMOND, HENRY D., DAR-  
 GEON, HAROLD W., and CRAVER, LLOYD F.: Lymphosarcoma in childhood (ab), Aug., 320  
 ROSENBLATT, MILTON B., and LISA, JAMES R.: Metastatic pulmonary melanoma of 15 months' duration (ab), July, 130  
 ROSENFIELD, GEORGE: Effects of a single lethal dose of total-body  $\text{Co}^{60}$  gamma irradiation on calves (ab), July, 157  
 ROSSH, RIEVA. See BASES, ROBERT  
 ROSS, PAUL: Intravascular gas in the radiological diagnosis of foetal death in utero (ab), Aug., 312  
 ROSS, RICHARD S., TAUSSIG, HELEN B., and EVANS, MELVIN H.: Late hemodynamic complications of anastomotic surgery for treatment of the tetralogy of Fallot (ab), Aug., 296  
 ROSS, STEVEN. See CAFFEY, JOHN  
 ROSSIGNOL, BERTRAND. See LENTINO, WALTER  
 ROSWIT, BERNARD, UNGER, SOL M., STEIN, JOSEPH, MALKSY, STANLEY J., and REID, CYPRIAN B.: Transverse laminography: the third dimension in body section roentgenography: applications in radiation therapy (ab), Dec., 955  
**ROTATION THERAPY.** See Bladder, cancer; Radioactivity, radiocobalt  
 ROTBLAT, J. See BOAG, J. W.  
 ROTH, M.: The problem of absorption of liquids from the lung—particularly bronchographic contrast material (ab), Dec., 942  
 ROTTROFF, G., and VIETEN, H.: Acute gastric and duodenal ulceration following endotracheal surgery (ab), Dec., 946  
 ROWLAND, L. P., SHAPIRO, J. H., and JACOBSON, H. G.: Neurological syndromes associated with congenital absence of the odontoid process (ab), July, 129  
 RUBENFELD, SIDNEY, and KAPLAN, GUSTAVE: Treatment of bronchogenic cancer with conventional x-rays according to a specific time-dose pattern, Nov., 671  
 —See BASES, ROBERT  
 —See LENTINO, WALTER  
 RUBIN, ELI H. See GOLDFISCHER, JEROME  
 RUBIN, PHILIP, and BURAN, ROBERT: Supervoltage irradiation in bladder carcinoma: 1952-1958, Aug., 209  
 RUBINSTEIN, BERTA M. See ESCHER, DORIS J. W.  
 —See FELL, STANLEY C.  
 —See JACOBSON, HAROLD G.  
 RUBIO, V. See ESPINO-VELA, J.  
 RUDOLPH, ABRAHAM M. See FYLER, DONALD C.  
 —See ONGLEY, PATRICK A.  
 RUBE, W.: Flexion of the lumbar spine as an aid in the localization of intervertebral disk herniation (ab), July, 143  
 RUFFIN, J. M. See ISLEY, J. K., Jr.  
 RUGGIERO, G., and JAY, MAURICE: A technic for arteriography of the external carotid artery (ab), Sept., 465  
 —THIBAUT, A., and BORIES, J.: Vertebral arteriography in neurological diagnosis (ab), Aug., 286  
 RUMPHORST, KARL. See PHILIPP, ERNST  
 RUSSO, P. E., and COIN, C. G.: Calcification of the hyoid, thyroid and tracheal cartilages in infancy: report of a case (ab), July, 130  
 RUTLEDGE, BOB J. See JOHNSON, PHILIP C.  
 RYAN, ALLAN J., GRISWOLD, MATTHEW H., ALLEN, EDWARD P., KATZENSTEIN, ROLF, GREENBERG, RICHARD, KEOGH, JOHN, and WILDER, CHARLES: Breast cancer in Connecticut, 1935-1953. Study of 8,396 proved cases (ab), Aug., 317  
 RYEL, JAMES W., and JACOBSON, GEORGE: Enlargement of the placenta as demonstrated by soft tissue placentography (ab), Sept., 481  
 RYNCKI, P. See KRIEG, P.  
  
**S**  
 SACHS, MAURICE D. See HART, LOREN E.  
 SAHEKI, SOROKU. See KAWANO, MASASHI  
 SAKKA, MASATOSHI, and KAMATA, RIKISABURO: An increase in tolerance in mice by field-fractionated (sieve) x-irradiation (ab), July, 158  
 SALA, J. M. See DEL REGATO, J. A.  
 SALEN, ERNST F. See NORDLANDER, SVERKER  
 SALERNO, PAUL R., and FRIEDELL, HYMER L.: A comparison of the effects of radioactive internal emitters and x-rays on antibody formation (ab), Sept., 500  
 SALIK, JULIAN O. See ABESHOUSE, BENJAMIN S.  
 —See MICHELSON, ELLIOTT

**SALINE**  
 —supportive therapy to animals exposed to whole-body irradiation (ab), Creighton A. Hardin et al, Aug., 328  
**SALIVARY GLANDS**  
 —angiography in children (ab), Bromley S. Freeman, Aug., 280  
**SALTZMAN, GEORG-FREDRIK:** Circulation through the posterior communicating artery in different compression tests. A preliminary report (ab), Nov., 808  
 Side effects. See Bilgrahn Form (ab), Dec., 949  
**SALZMAN, EMANUEL, SPURCK, ROBERT P., KIER, LAWRENCE C., and WATKINS, DAVID H.:** Opacifying gallstones (ab), Nov., 814  
**SAMENIUS, BRUNO.** See NORBERG, P. BERTIL  
**SAMMONS, BRUNO.** See LUND, RONALD R., PISCH-  
 NOTTE, WILLIAM O., and GARTENLAUB, CHARLES:  
 Contrast visualization of the venae cavae in management of lymphoma (ab), Dec., 944  
 —See STEINBERG, ISRAEL  
**—WILLIAMS, JOHN R., GARTENLAUB, CHARLES, BERNSTEIN, RICHARD L., NELSON, JAMES H., Jr., and GROOMAN, ROBERT B.:** The roentgenologic interpretation and uses of percutaneous retrograde pelvic arteriography (ab), Aug., 511  
**SAMSON, PAUL C.** See MERRILL, DUANE L.  
**SAMUEL, ERIC:** Serial tunnel for radiography during operations (ab), Dec., 956  
 —and SCOTT, WALTER: False negative shadows in intravenous cholangiography (ab), Sept., 476  
**SANDBERG, A. A.** See WIEST, W. G.  
**SANDERS, A. P.** See ISLEY, J. K., Jr.  
 —See REEVES, R. J.  
**SANTOS, GEORGE W., and COLE, LEONARD J.:** Effects of donor and host lymphoid and myeloid tissue injections in lethally x-irradiated mice treated with rat bone marrow (ab), July, 159  
**SARCOIDOSIS**  
 —sarcoïdosis with vertebral involvement (ab), Theodore Rodman et al, Nov., 817  
 —spinal sarcoidosis, Ernest H. Wood and Charles A. Bream, Aug., 226  
 —uncommon roentgen patterns of pulmonary sarcoidosis (ab), Benjamin Felson, Aug., 289  
**SARCOMA**  
 See also under organs and regions  
**Ewing's.** See Tumors, Ewing's  
**fibrosarcoma**  
 —primary fibrosarcoma of lung in young child: case treated by lobectomy and cobalt therapy (ab), F. S. Gerbasi et al, Dec., 957  
**lymphosarcoma.** See also Tumors, experimental  
 —lymphosarcoma in childhood (ab), Saul A. Rosenberg et al, Aug., 320  
 —lymphosarcoma of small intestine in infancy and childhood (ab), A. L. Mestel, Nov., 812  
**myosarcoma**  
 —leiomyosarcoma of nasopharynx (ab), Glen D. Dobben, Aug., 288  
**osteosarcoma**  
 —cystic lung lesions from metastatic sarcoma (ab), Neil E. Crow and Byron G. Brodgon, Dec., 941  
**round-cell**  
 —early diagnosis of malignant tumors of stomach: case of round-cell sarcoma (ab), P. Krieg et al, Oct., 649  
**SAUROV, M. M.** See MAREI, A. N.  
**SAUVAGE, LESTER R.** See JESSEPH, JOHN E.  
**SAVIGNAC, EUGENE M.:** The prenatal roentgen diagnosis of fetal hydrocephalus (ab), Aug., 312  
**SAYEG, J. A.** See SPALDING, J. F.  
**SAYERS, MARTIN P.** See KNOBLICH, HILDA  
 **SAYMAN, ISMET:** A new kymographic sign of myocardial infarct: dissociation of kymographic layers (ab), Nov., 805  
**SCALLON, JOSEPH.** See MENA, ISMAEL  
**SCANLON, PAUL W., DEVINE, KENNETH D., and WOOLNER, LEWIS B.:** Malignant lesions of the nasopharynx (ab), Oct., 663  
 —GEE, VERNON R., ERICH, JOHN B., WILLIAMS, HENRY L., and WOOLNER, LEWIS B.: Carcinoma of the palatine tonsil (ab), Nov., 824  
**SCANZIANI, EMILIO.** See de FRANCISCIS, PIETRO  
**SCAPHOID BONE, TARSAL**  
 —ossification and vascularization of tarsal navicular and their relation to Köhler's disease (ab), W. Waugh, Sept., 480  
**SCATLIFF, JAMES H., KUMMER, ALFRED J., and JANZEN, ARNOLD H.:** The diagnosis of pericardial effusion with intracardiac carbon dioxide, Dec., 871  
**SCHAEDE, A.** See HALLERBACH, H.  
**SCHAFROTH, H. J.:** Symmetric familial cerebral calcification (ab), Dec., 938  
**SCHEER, KURT ERNST.** See BECKER, JOSEF  
**SCHEIN, CLARENCE J.** See FELL, STANLEY C.  
**SCHEINBERG, LABE, and ELKIN, MILTON:** Hemangioma of the skull associated with intracranial angioma (ab), July, 128  
**SCHILDT, PAUL J.** See FORSYTHE, WILLIAM E.  
**SCHINZ, H. R.:** The hazards of short wave radiation (ab), July, 154  
**SCHLAGER, K.:** Concerning postpneumonic pseudo air cysts in children (ab), Aug., 291  
**SCHLÉGEL, JØRGEN U.** See SQUIRE, LUCY FRANK

**SCHMIDT, HERBERT W.** See BEAHS, OLIVER H.

**SCHMUTZER, KARL J.** and **LINDE, LEONARD M.**: Situs inversus totalis associated with complex cardiovascular anomalies (ab), Sept., 468

**SCHOBINGER, ROBERT**: The arteriographic picture of metastatic bone disease (ab), Oct., 655

—See LESSMANN, FRANZ P.

**SCHÖNBAUER, E.** See PSENNER, L.

**SCHOLTZE, H.** See LÖHR, Hh.

**SCHORR, S.**, **AVIAD, L.**, and **LAUFER, A.**: Vital staining with alizarin in clinical malignant conditions of bone, Sept., 410

**SCHRAER, HARALD**. See BAKER, PAUL T.

**SCHREINER, BERNARD F.**, and **GREENDYKE, ROBERT M.**: Radiation nephritis. Report of a fatal case (ab), Dec., 962

**SCHÜLLER-CHRISTIAN SYNDROME**: roentgen therapy in Hand-Schüller-Christian and related diseases (ab), Bertel Jørgsholm, Sept., 487

**SCHULTZ, E. C.**: Postoperative bone changes following lumbar disc removal (ab), July, 143

**SCHWARTZ, E. E.**, and **UPTON, A. C.**: Factors influencing the incidence of leukemia: special consideration of the role of ionizing radiation (ab), Aug., 327

**SCHWARTZ, SEYMOUR I.** See DEWESE, JAMES A.

**SCHWARTZ, SIDNEY P.** See ESCHER, DORIS J. W.

**SCHWARZ, E.**, and **BERGER, M.**: Esophagobronchial fistula (ab), Aug., 300

**SCHWARZ, GERHART S.**: Kilovoltage and radiographic effect. Investigation leading to a standard x-ray value scale (X.V.S.) system of simplified exposures for conventional and automatic radiography, Nov., 749

**SCHWARZ, GOTTWALD (obit)**, Aug., 272

**SCIATICA**: —clinical evaluation of sciatica (ab), Carl Hirsch, Sept., 478  
—discography in low back pain and sciatica: analysis of 73 operated cases (ab), Sverker Nordlander et al., Nov., 817

**SCINTILLATION COUNTER**. See Counters and Counting

**SCLERODERMA**: —lungs in scleroderma (ab), E. C. Bonard, July, 130  
—radiologic aspects of progressive scleroderma (ab), J. Pasquier, Sept., 473

**SCLEROMA**: —scleroma of upper air passages: clinicoradiological study of 84 cases (ab), G. E. Massoud and H. K. Awwad, Nov., 800

**SCLEROSIS**: See also Arteriosclerosis; Osteosclerosis  
—tuberous sclerosis, with particular attention to roentgenologic aspect (ab), L. Psenner and E. Schönauer, Oct., 662

**SCOLIOSIS**: See Spine, curvature

**SCOTT, J. C.**: Resolving scoliosis (ab), Dec., 951

**SCOTT, WALTER**. See SAMUEL, ERIC

**SEIBEL, ROY**. See CULVER, GORDON J.

**SELLA TURICA**: —hypophysectomy combined with intrasellar irradiation with yttrium 90; preliminary communication (ab), G. A. Edelstyn et al., Aug., 322  
—rate calcific shadow in parasellar space (ab), G. Thiele, Nov., 799  
—cells in health and disease: value of radiographic study of sella turcica in morbid anatomical and topographic diagnosis of intracranial tumors (ab), Mahmoud El Sayed Mahmoud, Sept., 464

**SEMINAL VESICLES**: —vasoseminal vesiculography in hypertrophy and carcinoma of prostate (ab), Gunnar W. Vestby, July, 147

**SHAMMA'A, MUNIR H.** and **BENEDICT, EDWARD B.**: Esophageal webs: a report of 58 cases and an attempt at classification (ab), Aug., 300

**SHANDS, A. R., JR.**, and **STEELE, MARSHALL K.**: Torsion of the femur: a follow-up report on the use of the Dunlap method for its determination (ab), July, 145

**SHANDS, W. C.**, and **JOHNSTON, J. HARVEY, JR.**: Aneurysm of the splenic artery (ab), Oct., 647

**SHAPIRA, RAYMOND**. See URSO, PAUL

**SHAPIRO, J. H.** See ESCHER, DORIS J. W.

—See JACOBSON, HAROLD G.

—See ROWLAND, L. P.

**SHAPIRO, MARVIN J.** See TENG, PAUL

**SHAPIRO, ROBERT**, and **ROBINSON, FRANKLIN**: Cervicodorsal diverticula of the subarachnoid space, Nov., 776

**SHAPIRO, SEYMOUR W.** See DECKER, HENRY G.

**SHARPE, K. W.** See ISLEY, J. K., Jr.

—See REEVES, R. J.

**SHEKARCHI, I. C.** See CONGDON, C. C.

**SHELINE, GLENN E.**, **JONES, MALCOLM D.**, and **MORRISON, LEWIS F.**: Radiation therapy for cancer of the tonsil (ab), Nov., 824

—See LINDSAY, STUART, and BELL, H. GLENN

**SHELINE, GLENN E.**, **JONES, MALCOLM D.**, and **MORRISON, LEWIS F.**: Radiation therapy for cancer of the tonsil (ab), Nov., 824

—See LINDSAY, STUART, and BELL, H. GLENN

**SHELINE, GLENN E.**, **JONES, MALCOLM D.**, and **MORRISON, LEWIS F.**: Radiation therapy for cancer of the tonsil (ab), Nov., 824

—See LINDSAY, STUART, and BELL, H. GLENN

—See STONE, ROBERT S.: Carcinoma of the larynx (ab), Oct., 664

**SHEPPARD, C. W.** See CONGER, ALAN D.

**SHERMAN, D.** See HAHN, P. F.

**SHERMAN, ROBERT S.**, and **CAHAN, WILLIAM G.**: Isolated fluoroscopy: an evaluation (ab), July, 148

**SHIBAEVA, E. D.**: Diagnosis of diseases of the mammary gland (ab), Sept., 488

**SHIELDS, R.** See BURNETT, W.

**SHILLITO, JOHN, JR.** See MURPHEY, FRANCIS

**SHIMOMURA, SEIICHI**. See BELL, A. L., LOOMIS, JR.

**SHINGLETON, W. W.** See ISLEY, J. K., JR.

**SHIRLEY, AMOS R.** (obit), Dec., 929

**SHIVELY, JAMES N.**, **MICHAELSON, SOL M.**, and **HOWLAND, JOE W.**: The response of dogs to bilateral whole-body  $\text{Co}^{60}$  irradiation. I. Lethal dose determination (ab), Sept., 493

**SHORT, D. S.** See EVANS, WILLIAM

**SHWARTZMAN PHENOMENON**: —comparison of effects on Schwartzman phenomenon of leukopenia produced by nitrogen mustard and by whole-body irradiation (ab), Douglas E. Johnston and Jon W. Howland, Aug., 328

**SIALOGRAPHY**. See Salivary Glands

**SICKLE-CELL DISEASE**: —hemoglobin SC disease (ab), W. P. Cockshott, Aug., 309

**SIDHU, S. S.** See ETTER, LEWIS E.

**SIEBER, WILLIAM K.**, and **GIRDANY, BERTRAM R.**: Rupture of the spleen in newborn infants. Recovery after splenectomy (ab), Sept., 476

**SIEVE THERAPY**. See Roentgen Rays, effects; Tumors, lymphoma

**SIGMOID**: —See also Colon  
—carcinoma of sigmoid colon; report of 2 inoperable cases with favorable results 5 or more years following radiation therapy (ab), C. C. Wang et al., Nov., 825  
—radiographic features of rectosigmoid endometriosis (ab), Gordon J. Culver et al., Oct., 651  
—villous adenoma of sigmoid colon, Thomas R. Frye, July, 71

**SILLO-FILLER'S DISEASE**. See Farmers and Farming

**SIMEONE, F. A.** See CROSS, F. S.

**SIMONS, C. S.** See LATOURETTE, H. B.

**SIMPSON, S. LEONARD**. See JACKSON, HARVEY

**SINGLETON, EDWARD B.**: Radiologic considerations in diagnosis and treatment of intussusception (ab), Nov., 812

—McNAMARA, DAN G., LEACHMAN, ROBERT D., COOLEY, DENTON A., and CHAU, PAUL M.: Radiological evaluation of isolated ventricular septal defects before and after surgical closure, July, 37

**SINUS**: —aortic. See Aneurysm, aortic

**SINUSES, PARANASAL**. See Ethmoid Sinus

**SITUS INVERSUS**. See Viscera, transposition

**SKIN**: —alteration of beta-radiation lesions of skin by cysteine, nitrite, hypoxia, spleen homogenate, and bone marrow homogenate (ab), A. K. Davis et al., July, 160  
—effect of fractionation of beta irradiation on rat skin (ab), Elly M. Jacobsen et al., July, 157  
—effect of prednisolone in treatment of superficial radiation lesions of skin and mucosae (ab), R. L. Abbé et al., July, 156  
—note concerning skin marker for use in radiation therapy, Milford D. Schulz, Oct., 621  
—tolerance of skin grafts to radiation: a study of post-mastectomy irradiated grafts (ab), R. W. Cram et al., Nov., 836  
—treatment and care of irradiated skin (ab), Karl-Heinz Kärcher, Sept., 495

**necrosis**: —skin necrosis complicating femoral arteriography (ab), D. S. Botseas and G. H. Lawrence, Nov., 809

**tumors**: —beta-mosaic: an adaptable radiation source for superficial radiation therapy (ab), Josef Becker and Kurt E. Scheer, July, 152  
—sieve (grid) radiotherapy of subcutaneous lymphoma (ab), E. Krokowski, Dec., 958

**SKORYNA, STANLEY C.**, **DOLAN, H. S.**, and **GELEY, A.**: Development of primary pyloric hypertrophy in adults in relation to the structure and function of the pyloric canal (ab), Nov., 811

**SKULL**. See Cranium

**SLEPIAN, A.** See PERESE, D. M.

**SLOANE, JACK A.** See HARROW, BENEDICT R.

**SMEDAL, MAGNUS I.** See KIEFER, EVERETT D.

**SMITH, GEORGE**. See BOYD, J. F.

**SMITH, GEORGE W.**, and **CHAVEZ, MARCELINO**: Lumbar extradural cysts—congenital: their proper classification (ab), Aug., 310

**SMITH, GORDON C.**: Radiation hazards in industry (ab), Nov., 835

**SMITH, HARRIS L.**, and **HAND, ALBERT M.**: Chondro-ectodermal dysplasia (Ellis-van Creveld syndrome). Report of two cases (ab), July, 142

**SMITH, JOHN**. See GORE, IRA

**SMITH, JOHN W.** See KIESEWETTER, WILLIAM B.

**SMITH, ROBERT R.** See CRAMER, LESTER M.

**SMITH, WILLIE W.** See HOLLICROFT, JOANNE W.

**SMITHERS, D. W.**: Cancer of the breast. A study of short survival in early cases and of long survival in advanced cases (ab), Sept., 485

—See MILL, W. A.

**SNIJDER, J., and VOSSENAAR, TH.:** Local reactivation of the primary tuberculous focus in the lung (ab), Sept., 466

**SNODGRASSE, RICHARD M. See DREIZEN, SAMUEL**

**SODIUM**

metabolism

- study on exchangeability of sodium and potassium by their isotopes in clinical conditions (ab), J. C. Demant et al., Sept., 493
- study on variations of exchangeability of sodium by radiosodium in course of treatment of edema: comparison with balance method (ab), J. C. Demant et al., Sept., 493

**SÖDERBERG, ULF, and WECKMAN, NILS:** Blood pressure changes in cerebral arteries during carotid angiography with Umrabid (ab), July, 128

**SØRENSEN, BENT:** Late results of radium therapy in cervical carcinoma: a clinical-statistical study on 798 patients treated at the Radium Centre, Copenhagen, during the period 1922-1929 (ab), Aug., 318

**SOFT TISSUES**

See also Plaeca

- angiography in soft-tissue hemangiomas (ab), Osborne Bartley and Ingmar Wickborn, Dec., 945
- periarticular soft-tissue changes as a late consequence of burns (ab), Jaromir Kolar and Radko Vrabeck, Nov., 815

**SOILA, PEKKA:** Congenital anomalies of the sound-conducting organs (ab), Sept., 465

**SOLOFF, LOUIS A., and ZATUCHNI, JACOB:** The angiographic features of a patent foramen ovale (ab), July, 132

**SOMMER, ARNO W. See HIGHTOWER, NICHOLAS C., Jr.**

**SOMOGYI, ZSUZSA. See FOGEL, MARIA**

**SONGE, ROBERT. See COOK, JAMES C.**

**SOSMAN, MERRILL CLARY (obit), Aug., 270**

**SOTERPOULOS, C., BERKEMAN, T., and GILMORE, JOHN H.:** Jejunogastric intussusception, Aug., 238

**SOUTHWOOD, W. F. W., and MARSHALL, V. F.:** A clinical evaluation of nephrotomography (ab), Oct., 659

**SPAFFORD, NORMA R. See LOWREY, GEORGE H.**

**SPALDING, J. F., HAWKINS, S. B., and SAYEG, J. A.:** Relative biological effect of 14-Mev neutrons with the broad beam root (Vicia faba) as a test system (ab), Oct., 670

—**HAWKINS, S. B., and STRANG, V. G.:** The relative effectiveness of neutrons of 1.4-Mev and 14-Mev energies and gamma rays in the reduction of fertility in the male mouse (ab), July, 158

**SPARKMAN, DONAL. See BLACKMAN, JAMES**

**SPARR, RICHARD A., and PRITCHARD, JACK A.:** Studies to detect the escape of amniotic fluid into the maternal circulation during parturition (ab), Sept., 491

**SPECIES**

- species differences in response to high radiation doses (ab), Howard L. Andrews, Sept., 496

**SPECTOR, SAMUEL, MATTHEWS, LeROY W., LEMM, FRANCES J., VAN ERP, YMKJE, and CLINE, JEAN:** Study of fat absorption utilizing  $^{141}$ -labeled corn oil in infants and children with and without steatorrhea (ab), Oct., 665

**SPECTRUM**

- spectral distributions of 280 kvp x-rays (ab), D. V. Cormack et al., Aug., 320

**SPEECH**

- cinefluorographic study of pharyngeal function related to speech, John A. Kirkpatrick and Richard W. Olmsted, Oct., 557

**SPENCER, H. NEWTON. See FRIEDENBERG, Z. B.**

**SPHINCTER MUSCLES**

See also Muscles, cricopharyngeus

**Oddi's**

- radiologic diagnosis of hypertonia of sphincter of Oddi and of cystic duct disease (ab), Lidio G. Mosca, Oct., 653

**SPIERS, F. W. See HINDMARSH, MARGARET**

**SPIES, TOM D. See DREIZEN, SAMUEL**

**SPINAL CANAL ROENTGENOGRAPHY**

See also Spinal Cord; Spine

- arterial anomalies of spinal cord: myelographic diagnosis and treatment by section of dentate ligaments (ab), Paul Teng and Marvin J. Shapiro, Sept., 480
- symposium: myography in diagnosis of diseases of spinal canal. Part 1. Clinical indications for myelographic examination in diseases of spinal cord and spinal canal (ab), Gerald Moss, Oct., 656
- symposium: myography in diagnosis of diseases of spinal canal. Part 2. Diseases of spinal cord and its covering with special reference to application of myelography (ab), M. D. Begley, Oct., 657
- symposium: myography in diagnosis of diseases of spinal canal. 3. Prolapse of intervertebral discs and vascular disease of spinal canal (ab), A. A. Merritt, Oct., 657
- symposium: myography in diagnosis of diseases of spinal canal. Part 4. Discussion (ab), C. W. D. Lewis, Oct., 657

**SPINAL CORD**

- neurological syndromes associated with congenital absence of odontoid process (ab), L. P. Rowland et al., July, 129

**blood supply**

- arterial anomalies of spinal cord: myelographic diagnosis and treatment by section of dentate ligaments (ab), Paul Teng and Marvin J. Shapiro, Sept., 480

**cysts**

- lumbar extradural cysts—congenital: their proper classification (ab), George W. Smith and Marcelino Chavez, Aug., 310

**diseases**

- symposium: myelography in diagnosis of diseases of spinal canal. Part 1. Clinical indications for myelographic examination in diseases of spinal cord and spinal canal (ab), Gerald Moss, Oct., 656
- symposium: myelography in diagnosis of diseases of spinal canal. Part 2. Diseases of spinal cord and its covering with special reference to application of myelography (ab), M. D. Begley, Oct., 657

**tumors**

- postoperative dissemination of astrocytoma of spinal cord along ventricles of brain; case (ab), D. M. Perese et al., Nov., 818

**SPINE**

See also Atlas and Axis

- degenerative changes in cervical spine (ab), Z. B. Friedenberg et al., Nov., 816
- dysphagia caused by hypertrophic changes in cervical spine; 2 cases (ab), Oliver H. Beahrs and Herbert W. Schmidt, Dec., 950
- rate of enlargement of spinal canal (ab), G. Lombardi and G. Morello, July, 142

**abnormalities**

- achondroplasia of pelvis and lumbosacral spine: some roentgenographic features (ab), John Caffey, July, 144
- Marfan syndrome, with special reference to congenital enlargement of spinal canal (ab), J. D. Nelson, Aug., 310

**abscess. See Abscess, epidural**

**ankylosis; arthritis**

- ankylosing spondylitis (ab), F. Dudley Hart, Oct., 664
- comparative radiological study of Reiter's disease, rheumatoid arthritis and ankylosing spondylitis (ab), R. M. Mason et al., Dec., 949
- little known radiological sign of vertebral column in ankylosing spondylitis (Strümpell-Marie-Bechterew's disease) (ab), K. Maier, Oct., 657
- osteotomy of spine, formation of wedge vertebra in hyperextension gap, Michael Burman, July, 104
- spontaneous dislocation of atlanto-axial articulation occurring in ankylosing spondylitis and rheumatoid arthritis (ab), T. L. C. Pratt, Nov., 801

**arthritis. See Spine, ankylosis; arthritis**

- dorsal kyphosis in chronic obstructive lung disease (ab), Denis F. J. Halmagyi, Dec., 951
- iliac apophysis and evolution of curves in scoliosis (ab), Alexander L. Závada and J. I. P. James, July, 144
- resolving scoliosis (ab), J. C. Scott, Dec., 951

**diseases**

- sarcoidosis with vertebral involvement (ab), Theodore Rodman et al., Nov., 817
- spinal sarcoidosis, Ernest H. Wood and Charles A. Bream, Aug., 226
- undulant fever spondylitis (ab), F. Zammit, Oct., 656
- vertebra plana (ab), A. T. Fripp, July, 142

**dislocations**

- so-called spontaneous cervical dislocations: clinical, roentgenological, surgical and postmortem study of pathogenesis and treatment in 5 cases (ab), Tormod Hauge, Sept., 477

**fractures**

- bony bridges following transverse process fractures of lumbar vertebrae (ab), C. Esser, Dec., 950

**intervertebral disks**

- disgraphy in low back pain and sciatica: analysis of 73 operated cases (ab), Sverker Nordlander et al., Nov., 817
- epidural tuberculous abscess simulating herniated lumbar intervertebral disk; case (ab), Henry G. Decker et al., Dec., 955
- flexion of lumbar spine as aid in localization of intervertebral disk herniation (ab), W. Rube, July, 143
- on surgically treated herniated intervertebral disks (ab), Bertil Knutsson and Gunnar Wiberg, Nov., 816
- postoperative bone changes following lumbar disk removal (ab), E. C. Schultz, July, 143
- results of abrodil myelography in prolapse of lumbar intervertebral disk (ab), C. W. Fassbender et al., Dec., 950
- symposium: myelography in diagnosis of diseases of spinal canal. Part 3. Prolapse of intervertebral disks and vascular disease of spinal canal (ab), A. A. Merritt, Oct., 657

**roentgenography. See also Spinal Canal Roentgenography; other subheads under Spine**

- vertebral pedicle sign: a roentgen finding to differentiate metastatic carcinoma from multiple myeloma (ab), Harold G. Jacobson et al., Sept., 477
- wear and tear on spine: contribution to reduction of radiation to patient (ab), K. Hohl, Oct., 670

**surgery. See Spine, intervertebral disks**

**tuberculosis. See Abscess, epidural**

**SPINE—cont.**  
—osteoid osteoma of vertebrae (ab), W. T. Mustard and F. W. DuVal, Dec., 951

**SPINNER, MORTON.** See **LEVINE, JACK**

**SPIRO, MARTIN:** A comparison between radiology and esophagoscopy in the investigation of reflux oesophagitis (ab), Sept., 473

**SPITZER, RICHARD, and QUILLIAM, R. L.:** Observations on congenital anomalies in teeth and skull in two groups of mental defectives (comparative study) (ab), Sept., 465

**SPLEEN**  
—alteration of beta-radiation lesions of skin by cysteine, nitrite, hypoxia, spleen homogenate, and bone-marrow homogenate (ab), A. K. Davis et al., July, 160  
—intravenous radioactive gold in treatment of chronic leukemia: comparison of results with conventional roentgen therapy to splenic area (ab), P. F. Hahn et al., Oct., 665  
—lymphatic tissue changes in lethally irradiated mice given spleen cells intravenously (ab), C. C. Congdon et al., July, 160  
—necropsy evaluation of gas contrast roentgen visualization of liver and spleen (ab), Samuel Zelman, Oct., 652  
—percutaneous selective angiography of celiac artery (value in diagnosis of morbid processes of pancreas, liver, and spleen) (ab), Per Ödman, Aug., 288  
—short and long term observations concerning effect of homologous and heterologous cell-free spleen extracts on radiation mortality in mice and guinea-pigs (ab), F. Ellinger, Dec., 965  
—splenectomy in hemolytic anemia: results predicted by body scanning after injection of  $\text{Cr}^{51}$ -tagged red cells (ab), Paul R. McCurdy and Charles E. Rath, Aug., 322  
—studies with transplantable AK4 mouse leukemia. III. Effect of spleen and marrow shielding on AK4 leukemic implants in homologous strains of irradiated mice (ab), Irene U. Boone et al., Aug., 328  
—total-body x-irradiation and splenectomy in guinea-pigs, Pietro de Franciscis and Emilio Scanziani, Sept., 424

**rupture**  
—rupture of spleen in newborn infants: recovery after splenectomy (ab), William K. Sieber and Bertram R. Girdany, Sept., 476

**SPLENECTOMY.** See **Spleen**

**SPLENOPORTOGRAPHY.** See **Portal Vein**

**SPODE, ERNST.** See **ERNST, HELMUT**

**SPONDYLITIS.** See **Spine**

**SPROUL, R. D., FRASER, ROBERT G., and MacKINNON, K. J.:** Aneurysm of the renal artery (ab), July, 134

**SPRINT, WILLIAM H., PETERS, RICHARD M., and HOLDER, DAVID L.:** The significance of alterations in the lung arterial pattern, July, 134

**SPURCK, ROBERT P.** See **SALZMAN, EMANUEL**

**SPUTUM.** See **Paragonimiasis**

**SQUIRE, JACK.** See **ROBERTS, LEONARD M.**

**SQUIRE, LUCY FRANK, and SCHLEGEL, JORGEN U.:** Pyrography in renal disease with hypertension. Correlation between pyrography findings and differential renal function studies, Dec., 849

**STAFFURT, J. S., and BIRCHALL, L.:** The significance of the protein-bound radioactive iodine determination in hyperthyroidism (ab), Nov., 830

**STAINS AND STAINING**  
—vital staining with alizarin in clinical malignant conditions of bone, S. Schorr, I. Aviad and A. Laufer, Sept., 410

**STANHAM, J.** See **FIANDRA, O.**

**STANTON, LEONARD:** Penumbra measurements of super-voltage and cobalt-60 machines by a photographic method, Aug., 253

**STARK, STANLEY:** Diagnostic implications of the ileostomy valve (ab), Sept., 475

**STARKEY, GEORGE W. B.** See **ONGLEY, PATRICK A.**

**STAUFFER, HERBERT M.** See **MURTAGH, FREDERICK**

—See **WINTERS, WILLIAM**

—See **YOUNG, BARTON R.**

**STEATORRHEA**  
—study of fat absorption utilizing  $\text{I}^{131}$ -labeled corn oil in infants and children with and without steatorrhea (ab), Samuel Spector et al., Oct., 665

**STEEL, MARSHALL K.** See **SHANDS, A. R., Jr.**

**STEELE, RODERIC E.** See **KALLMAN, ROBERT F.**

**STEIN, IRVING F., Sr.:** The role of gynecography in the evaluation of the infertile woman (ab), July, 147

**STEIN, JOSEPH.** See **ROSWIT, BERNARD**

**STEINBERG, ISRAEL:** Congenital absence of a main branch of the pulmonary artery. Report of three new cases associated respectively with bronchiectasis, atrial septal defect and Eisenmenger's complex (ab), Aug., 293

Roentgen diagnosis of anomalous pulmonary venous drainage of right lung into inferior vena cava. Report of three new cases (ab), Dec., 944

—See **HOLMAN, CRANSTON W.**

**MAISEL, BERNARD, and VOGEL, F. STEPHEN:** Pulmonary arteriovenous fistula associated with capillary telangiectasia (Rendu-Osler-Weber disease): report of a case illustrating use of metal casting for demonstrating the lesion (ab), Oct., 647

—and **SAMMONS, B. P.:** Aneurysmal dilatation of the aortic sinuses in coarctation of the aorta: report of two new cases and review of the literature (ab), Aug., 26

**STEINHART, L.** See **NETTL, S.**

**STENHOUSE, DAVID:** Biligratin and the non-visualized gall-bladder (ab), Aug., 306

**STERILITY**  
—comment on Dr. Ira Kaplan's article on "Genetic Effects in Children and Grandchildren of Women Treated for Infertility and Sterility by Roentgen Therapy" (letter to editor), R. R. Newell, Aug., 275; reply by Dr. Kaplan, Nov., 791

—role of gynecography in evaluation of infertile woman (ab), Irving E. Stein, Sr., July, 147

**STERN, W. EUGENE, HANAFEE, WILLIAM, and WILK, STEFAN:** Intracranial pneumoangiography in the verticosubmental position. A neuroangiographic refinement (ab), July, 127

**STILES, FRANK C.:** Coproliths (calciified appendiceal calculi) in children (ab), Oct., 631

**STOREN, GUNNAR:** Traumatic dislocation of the radial head as an isolated lesion in children. Report of one case with special regard to roentgen diagnosis (ab), Nov., 818

**STÖSSEL, H. G.** See **FASSBENDER, C. W.**

**STOMACH**  
See also **Digestive System; Gastrointestinal Tract**  
**blood supply**  
—clinical diagnosis in gastrointestinal hemorrhage: a planned investigation including arteriographic studies of human stomach (ab), John K. Wagstaff, Nov., 810

**cancer**  
—benign lesions of pyloric antrum simulating carcinoma, with comments on value of gastroscopy in diagnosis of antral lesions (ab), J. N. Pattinson and G. Osborne, Nov., 811

—carcinoma of gastric stump after resection for benign peptic ulcer (ab), Ch. Debray et al., Sept., 474

—chronic antral gastritis as precancerous condition (ab), S. N. Popov and Z. Ya. Karmanova, Nov., 810

—roentgen detection of early gastric neoplasm; case (ab), Lloyd K. Mark, Oct., 649

**inflammation**  
—chronic antral gastritis as precancerous condition (ab), S. N. Popov and Z. Ya. Karmanova, Nov., 810

—giant hypertrophic (tumor simulating) gastritis (ab), P. E. S. Palmer, Aug., 301

**intussusception.** See **Intussusception**  
—incarceration of stomach and intestine after traumatic rupture of diaphragm (ab), F. Kümerle, Sept., 474

**perforation**  
—perforation of stomach in the newborn (ab), Richard B. Magee and R. Marvel Keagy, Sept., 474

**roentgenography**  
—observations on radiologic anatomy of esophagogastric junction, Alan S. Johnstone, Oct., 501

—roentgen kymographic sign in gastrocardiac syndrome of Römhild (ab), H. Grasser, Dec., 943

**surgery.** See also **Peptic Ulcer; Stomach; cancer**  
—cancer in gallbladder after elective gastric surgery (ab), H. T. Cox et al., Aug., 306

—jejunogastric intussusception (complication of gastroenterostomy), C. Soteropoulos, Y. Berkmen and John H. Gilmore, Aug., 238

—postoperative x-ray findings following cardia resection and gastrectomy (ab), G. Beck, Oct., 649

—radiological demonstration of variations in fluid content of small intestine during dumping attacks (ab), E. Amdrup et al., Aug., 304

—roentgen diagnosis of retrograde jejunogastric intussusception (following gastrojejunostomy or gastric resection), Lester W. Paul and Charles Benkendorf, Aug., 234

—technical surgical factors which enhance or minimize postgastrectomy abnormalities (ab), William E. Abbott et al., Aug., 301

**torsion.** See **Stomach, volvulus**

**tumors**  
—aberrant pancreatic tissue in stomach, Donald R. Rooney, Aug., 241

—early diagnosis of malignant tumors of stomach: case of round-cell sarcoma (ab), P. Krieg et al., Oct., 649

—giant hypertrophic (tumor simulating) gastritis (ab), P. E. S. Palmer, Aug., 301

**ulcers.** See **Peptic Ulcer**  
—torsion of stomach as cause of vomiting in infancy (ab), S. Eek and H. Hagelsteen, Aug., 301

**STONE, ROBERT S.** See **SHELLINE, GLENN E.**

**STORAASLI, JOHN P.** See **JEFFERIES, WILLIAM MCK.**

**STORER, JOHN B.:** Rate of recovery from radiation damage and its possible relationship to life shortening in mice (ab), Dec., 965

**STRADLING, PETER, and DIXON, W. M.:** Possible disadvantages of a chest radiography service for general practitioners (ab), Nov., 801

**STRANG, V. G.** See **SPALDING, J. F.**

**STREET, D. F.** See **BOOTH, C. C.**

**STRICKER, E., and KLINGER, M.:** Ipsilateral carotid thrombosis in hemiparesis (ab), Sept., 465

**STRONTIUM, RADIOACTIVE.** See Radioactivity, radioactive strontium

**STRUMPELL-MARIE-BECHTEREW'S DISEASE.** See Spine, ankylosis; arthritis

**SUBARACHNOID SPACE.** See Meninges

**SUPRARENAL GLANDS.** See Adrenals

**SURGERY**  
See also under diseases, organs, and regions, as Lungs, surgery; Stomach, surgery; etc.

—serial tunnel for radiography during operations (ab), Eric Samuel, Dec., 956

**postoperative complications.** See Spine, intervertebral disks

**SUTTON, DAVID.** See EASTCOTT, H. H. G.

—See PEART, W. S.

**SUTOW, WATARU W.** Prognosis in neuroblastoma of childhood (ab), July, 151

**SUWANIK, ROMSAL, and HARINSUTA, CHAMLONG.** Pulmonary paragonimiasis. An evaluation of roentgen findings in 38 positive sputum patients in an endemic area in Thailand (ab), Dec., 942

**SVIHLA, GEORGE.** See LESTER, YEVETTE S.

**SWAIMAN, KENNETH F., AUSTRIAN, SOL, and RAILE, RICHARD B.** Congenital atresia of the inferior vena cava, common iliac veins, and left innominate vein; a case with extensive development of superficial venous collateral circulation (ab), Aug., 294

**SWEDIN, B.** See HELDE, M.

**SWEET, W. H.** See BAGNALL, H. J.

**SZILAGYI, D., EMERICK, McDONALD, RICHARD T., and FRANCE, LLOYD C.** The applicability of angioplasty procedures in coronary atherosclerosis: an estimate through postmortem injection studies (ab), July, 134

**T**

**TACHYCARDIA.** See Heart, rate

**TANNIC ACID**  
—use of barium tannic acid enema in investigation of large intestine (ab), A. K. Bhattacharya and D. E. Paterson, Aug., 306

**TANTALUM, RADIOACTIVE.** See Radioactivity, radio-tantalum

**TAPLEY, NORAH duV.** See REESE, A. B.

**TARP, OLE.** Tomography of the temporal bone with the polytome (ab), Dec., 938

**TAUSEND, M. E., and MARCUS, MILTON.** Solitary unicameral bone cyst in a seven-week-old infant (ab), Nov., 815

**TAUSSIG, HELEN B.** See ROSS, RICHARD S.

**TAUSSIG-SNELLEN-ALBERS SYNDROME.** See Heart, abnormalities

**TAYLOR, A. R.** See EDELSYNN, G. A.

**TAYLOR, E. E. T.** Duodenal megalobulbus and annular pancreas (ab), Nov., 811

**TAYLOR, HOWARD C., JR.** See FRICK, HENRY CLAY, II

**TAYLOR, R. M.** See JOHNS, H. E.

**TEASDALE, ROBERT D.** Posterior fossa arteriovenous aneurysm with occlusion of a vertebral artery (ab), July, 129

**TEETH**  
—observations on congenital anomalies in teeth and skull in 2 groups of mental defectives (comparative study) (ab), Richard Spitzer and R. L. Quilliam, Sept., 465

—radiation dose reduction in dental roentgenography (ab), Lewis E. Ester et al., Oct., 670

**TELANGiectASIS**  
—pulmonary arteriovenous fistula associated with capillary telangiectasia (Rendu-Osler-Weber disease); case illustrating use of metal casting for demonstrating the lesion (ab), Israel Steinberg et al., Oct., 647

**TELEVISION**  
—quantitative aspects of television techniques in diagnostic radiology (ab), G. A. Hay, Sept., 483

—television pick-up tubes for x-ray screen intensification (ab), G. B. Banks, Sept., 484

**TEMPLETON, FREDERIC E.** X-ray examination of the esophagus (ab), Sept., 472

**TEMPORAL BONE**  
—tomography of temporal bone with polytome (ab), Ole Tarp, Dec., 938

**TENG, CHING TSENG, and BRENNAN, JAMES C.** Acute mercury vapor poisoning. A report of four cases with radiographic and pathologic correlation, Sept., 354

**TENG, PAUL, and SHAPIRO, MARVIN J.** Arterial anomalies of the spinal cord. Myelographic diagnosis and treatment by section of dentate ligaments (ab), Sept., 480

**TERRY, ROGER.** See DeWEESE, JAMES A.

**TESTES**  
undescended  
—should intravenous pyelography be a routine procedure for children with cryptorchism or hypospadias? (ab), Lester M. Felton, Dec., 954

**TETRALOGY OF FALLOT.** See Heart, abnormalities

**TEXTER, E. CLINTON, JR.** See VANTRAPPEN, GASTON

**THAGGARD, ALVIN, JR.** See MUNSLAW, RALPH A.

**THAILAND**  
—pulmonary paragonimiasis: evaluation of roentgen findings in 38 positive sputum patients in an endemic area in Thailand (ab), Romsai Suwanik and Chamlong Harinsuta, Dec., 942

**THAL, ALAN P., RICHARDS, L. STEPHEN, GREENSPAN, RICHARD, and MURRAY, M. JOHN.** Arteriographic studies of the coronary arteries in ischemic heart disease (ab), Oct., 646

—See RICHARDS, L. STEPHEN

**TERATRON.** See Radioactivity, radiocobalt

**THIBAUT, A.** See RUGGIERO, G.

**THIELE, G.** A rare calcific shadow in the parasellar space (ab), Nov., 799

**THIXOKON.** See Urethra, roentgenography

**THOMAS, E. DONNALL, LOCHTE, HARRY L., JR., and FERREBEE, JOSEPH W.** Irradiation of the entire bone and marrow transplantation: some observations and comments (ab), Dec., 963

—See FERREBEE, JOSEPH W.

**THOMPSON, IAN M.** A safe contrast medium for urethrography (ab), Aug., 314

—and AMAR, ARJAN D.: Clinical importance of ureteral duplication and ectopia (ab), Aug., 313

**THOMPSON, JACK A.** See JOHNSON, HENRY C., JR.

**THOMPSON, JERRY B.** See WHITEHEAD, RICHARD W.

**THOMS, JOHANNES.** Cleidocranial dysostosis. Report of two cases with special characteristics (ab), Oct., 655

**THOMSON, S. A.** See MESTEL, A. L.

**THORAX**  
See also Bronchi; Heart; Lungs; Mediastinum; Ribs; etc.  
—relationship of cardiac silhouette to altered respiratory dynamics in congenital heart disease in infants, Lawrence A. Davis and Margaret Vermillion, July, 49

**roentgenography**  
—possible disadvantages of a chest radiography service for general practitioners (ab), Peter Stradling and W. M. Dixon, Nov., 801

**surgery**  
—acute gastric and duodenal ulceration following endotracheal surgery (ab), G. Rotthoff and H. Vieten, Dec., 946

**THORIUM**  
—effect of internal emitters on red cell survival in beagle dogs (ab), John E. Parkinson, Nov., 836

**dioxide**  
—Thorotrast disease (ab), Jayme Landman and Nicola C. Caminha, Aug., 327

**THOROTRAST.** See Thorium, dioxide

**THROMBOCYTOPENIA**  
—hemangioma with thrombocytopenia (ab), Harold W. Dargeon et al., Dec., 958

**THROMBOSIS**  
carotid  
—ipsilateral carotid thrombosis in hemiparesis (ab), E. Stricker and M. Klingler, Sept., 465

renal  
—radiographic findings in renal vein thrombosis, Norman Zheutlin, Dixon Hughes and Bernard J. O'Loughlin, Dec., 884

**THUMB.** See Fingers and Toes

**THURMER, G.** See BEETLESTONE, A.

**THYROID**  
See also Goiter  
—thyroxine metabolism in man estimated by means of  $^{131}\text{I}$ -labeled l-thyroxine (ab), Thorkild Friis, Sept., 489

cancer  
—calcification in papillary carcinoma (ab), S. Holtz and W. E. Powers, Oct., 639

—carcinoma of lingual thyroid treated with radioactive iodine (ab), W. A. Mill et al., Nov., 830

—carcinoma of thyroid following irradiation (ab), A. W. G. Goodwin, Aug., 325

—successful radioiodine therapy in 2 cases of metastasizing carcinoma of thyroid (ab), J. H. Muller, Oct., 665

—thyroid neoplasms following irradiation (ab), G. M. Wilson et al., Aug., 325

diseases  
—subacute thyroiditis (ab), H. Clarkson Meredith, Jr., Dec., 959

—thyroid function and metabolism of iodine in patients with subacute thyroiditis (ab), Sidney H. Ingbar and Norbert Freinkel, Aug., 323

—treatment of diseases of thyroid by irradiation (ab), W. P. Holman, Dec., 960

—use of TSH test in diagnosis of thyroid disorders, William McK. Jefferies, Richard P. Levy and John P. Storaasli, Sept., 341

function. See also Thyroid, diseases  
—acute effect of organic binding of iodine on iodine concentrating mechanism of thyroid gland (ab), Seymour H. Wollman and Franklin E. Reed, July, 153

—effect of food on 3-hour thyroidal uptake of  $^{131}\text{I}$  in human subjects (ab), David J. Turrell et al., Sept., 489

—effect of oral Lipiodol on thyroidal  $^{131}\text{I}$  uptake and serum protein-bound iodine concentration (ab), Anne C. Carter et al., Dec., 960

—immediate uptake of radioactive iodine as a test of thyroid function (ab), Helen E. A. Farran, Oct., 664

**THYROID, function—cont.**

- influence of age on excretion of radioactive iodine (ab), G. A. MacGregor and H. Wagner, Sept., 489
- plasma protein-thyroid hormone complex in man. III. Further studies on use of the in vitro red blood cell uptake of  $I^{131}$ -l-triiodothyronine as diagnostic test of thyroid function (ab), Milton W. Hamolsky et al, Nov., 829
- thyroid function in supraventricular tachycardias: turnover of intravenously infused  $I^{131}$ -labeled thyroxine and the red blood cell uptake of  $I^{131}$ -labeled l-triiodothyronine (ab), George S. Kurland et al, Nov., 829
- use of iodine 132 for thyroid function tests (ab), K. E. Halman and E. E. Pochin, Sept., 488
- use of iodine 132 in studies of thyroid function (ab), A. W. G. Goolden and J. R. Mallard, Sept., 488
- hyperthyroidism**
  - acute granulocytic leukemia after radioactive iodine therapy for hyperthyroidism (ab), William M. Kennedy and Robert G. Fish, Nov., 830
  - occurrence of thyroid nodules in children following therapy with radioiodine for hyperthyroidism (ab), Glenn E. Sheline et al, Nov., 830
  - radioiodine tracer tests in diagnosis of hyperthyroidism (ab), K. H. Clarke et al, Nov., 828
  - significance of protein-bound radioactive iodine determination in hyperthyroidism (ab), J. S. Staffurth and I. Birchall, Nov., 830
  - treatment of thyrotoxicosis with  $I^{131}$ : review of 500 cases (ab), G. W. Blomfield et al, Dec., 959
- hypothyroidism**
  - early diagnostic criteria of congenital hypothyroidism: a comprehensive study of 49 cretins (ab), George H. Lowrey et al, Aug., 288
- lingual.** See **Thyroid, cancer surgery**
- postoperative myxedema cardiopathy: an unusual instance which developed in immediate postoperative period; case report and review of literature (ab), F. G. Hoffman, Dec., 943

**THYROIDITIS. See Thyroid, diseases****THYROIDINE**

- modification of late radiation injury with l-triiodothyronine, Arvin S. Glicksman, Rulon W. Rawson and James J. Nickson, Aug., 178
- plasma protein-thyroid hormone complex in man. III. Further studies on use of the in vitro red blood cell uptake of  $I^{131}$ -l-triiodothyronine as diagnostic test of thyroid function (ab), Milton W. Hamolsky et al, Nov., 829
- thyroid function in supraventricular tachycardias: turnover of intravenously infused  $I^{131}$ -labeled thyroxine and the red blood cell uptake of  $I^{131}$ -labeled l-triiodothyronine (ab), George S. Kurland et al, Nov., 829

**THYROTOXICOSIS. See Thyroid, hyperthyroidism**  
**THYROTROPIN. See Pituitary Preparations****THYROXINE**

- thyroid function in supraventricular tachycardias: turnover of intravenously infused  $I^{131}$ -labeled thyroxine and the red blood cell uptake of  $I^{131}$ -labeled l-triiodothyronine (ab), George S. Kurland et al, Nov., 829
- thyroxine metabolism in man estimated by means of  $I^{131}$ -labeled l-thyroxine (ab), Thorkild Friis, Sept., 489

**TIBBS, D. J., and LESLIE, W. G.: Apparatus for remote injection in radioisdiagnostic procedures (ab), Aug., 315****TIMERS; TIMING. See Roentgen Rays, diagnosis****TISSUE**

- effect of x-irradiation on antioxidant activity of mammalian tissues (ab), Albert A. Barber and Karl M. Wilbur, Dec., 966
- immediate effects of irradiation of elastic tissues with x-rays, radium, and radioactive cobalt (ab), Stefan Jellinek, Sept., 498

**culture**

- growth of primate and nonprimate tissue culture cell lines in x-irradiated and cortisone-treated rats (ab), Lewis L. Coriell et al, Oct., 669

**TOAL, JANE NICOLET, REID, JAMES C., WILLIAMS, R. BLAND, Jr., and WHITE, JULIUS: Effect of total-body x radiation from near-threshold to tissue-lethal doses on small-bowel epithelium of the rat. II. Changes in nucleic acid and protein synthesis in relation to cell division (ab), July, 157**

—See **WILLIAMS, R. BLAND, Jr.**

**TOLENTINO, S. C. See FRIEDENBERG, Z. B.****TOMLINSON, R. H. See JAIME, C. H.****TOMOGRAPHY. See Body-Section Roentgenography****TONGUE**

- carcinoma of lingual thyroid treated with radioactive iodine (ab), W. A. Mill et al, Nov., 830

**TONSILS**

- carcinoma of palatine tonsil (ab), Paul W. Scanlon et al, Nov., 824
- radiation therapy for cancer of tonsil (ab), Glenn E. Sheline et al, Nov., 824

**TORNER-SOLER, M., BALAGUER-VINTRÓ, L., and CARRASCO-AZEMAR, J.: Cardiac dextroversion: hypoplasia of the right pulmonary artery with right venous pulmonary drainage into the inferior vena cava (ab), July, 132****TORULOSIS**

- torulosis (ab), M. G. F. Donnan, Nov., 822

**TRACHEA**

- calcification of hyoid thyroid and tracheal cartilages in infancy; case, P. E. Russo and C. G. Coin, July, 130

**TREVES, NORMAN, and HOLLEB, ARTHUR L.: A report of 549 cases of breast cancer in women 35 years of age or younger (ab), July, 149****TRIETHYLENE MELAMINE. See Melamine****TRIOLEIN**

- modification of  $I^{131}$  triolein test of fat absorption utilizing a capsule test meal (ab), J. K. Isley, Jr., et al, Sept., 489

**TROCHANTER. See Femur****TROPICAL DISEASES**

- radiological investigation of small intestine in tropical idiopathic malabsorption (ab), D. E. Paterson and S. J. Baker, Aug., 303

**TROUT, E. DALE, KELLEY, JOHN P., and LUCAS, ARTHUR C.: Determination of half-value layer, July, 107****TRUSLER, G. A. See MESTEL, A. L.****TSH. See Pituitary Preparations****TUBERCULOSIS**

- also Abscess, epidural; Femur; Tuberculosis, Pulmonary

- experimental pulmonary emphysema: production of emphysematous bullae in rabbit by infection with tuberculosis (ab), John W. Bell, Oct., 644

**TUBERCULOSIS, PULMONARY**

- local reactivation of primary tuberculous focus in lung (ab), J. Snijder and Th. Vossehaar, Sept., 466

- pulmonary infiltration and fibrosis of unknown etiology: the risk of developing active pulmonary tuberculosis (ab), John F. Chace et al, Dec., 941

**cancer and tuberculosis**

- pulmonary tuberculosis associated with carcinoma of lung (ab), A. J. Christoforidis, Dec., 940

- endoscopic aspects of primary tuberculosis in children (ab), John F. Daly, Oct., 641

**roentgenography**

- role of photofluorography in Navy tuberculosis control (ab), John F. Chace and E. P. Coffay, Jr., Nov., 801

**surical therapy**

- large pseudoaneurysm caused by extraperitoneal plastic ball prosthesis (ab), Masashichi Kawano et al, Aug., 29

**TUBES. See Roentgen Rays, apparatus; Roentgen Rays, technic****TUDWELL, R. C., and PALIN, A.: The use of radioactive phosphorus for the detection of intraocular tumours (ab), Aug., 321****TUMORS**

- See also Cancer; Sarcoma; and under names of organs and regions

**adenoma. See also Lungs, tumors**

- villous adenoma of sigmoid colon, Thomas R. Frye, July, 71

**angioma**

- angiography in soft-tissue hemangiomas (ab), Osborne Bartley and Ingmar Wickbom, Dec., 945

- dyschondroplasia with multiple hemangioma (Maffucci's syndrome) (ab), Kurt Marberg et al, Sept., 477

- hemangioma of skull associated with intracranial angioma (ab), Labe Scheinberg and Milton Elkin, July, 128

- hemangioma with thrombocytopenia (ab), Harold W. Dargeon et al, Dec., 958

- treatment of hemangioma of infants and young children (ab), Robert J. Reeves, Nov., 823

**astrocytoma**

- postoperative dissemination of astrocytoma of spinal cord along ventricles of brain; case (ab), D. M. Perese et al, Nov., 818

**chondroma**

- roentgenologic characteristics of chondroma of larynx (ab), Brit B. Gay, Jr., et al, Oct., 639

**dermoid**

- dermoid and epidermoid tumors in central nervous system of adults (ab), Collin S. MacCarty et al, Dec., 954

**epidermoid**

- dermoid and epidermoid tumors in central nervous system of adults (ab), Collin S. MacCarty et al, Dec., 954

**esthesioneuroblastoma. See Tumors, neuroblastoma****Ewing's**

- Ewing's sarcoma: 10-year survivals; report of case with recurrent pulmonary metastases (ab), Harold N. Harrison, Sept., 487

**experimental**

- combined effect of radiogold and nitrogen mustard and radiogold and certain other compounds on Ehrlich ascites carcinoma (ab), Richard W. Whitehead et al, Oct., 666

- effects of chemotherapy and irradiation therapy on differentiation of experimental tumors (ab), Nathan B. Friedman and Eileen Drutz, Oct., 668

- endotoxin treatment and x-irradiation in mice bearing transplanted tumors (ab), Joanne W. Hollcroft and Willie W. Smith, July, 159

**TUMORS, experimental—cont.**

- studies on anemia of tumor-bearing animals. I. Distribution of radioiron following injection of labeled erythrocytes (ab), Robert E. Greenfield et al, Sept., 492
- treatment of mouse lymphosarcoma by total-body x-irradiation and by injection of bone marrow and lymph-node cells (ab), M. J. de Vries and O. Vos, Nov., 837
- glioblastoma. See Brain, tumors
- hemangioma. See Tumors, angioma
- leiomyoma. See Tumors, myoma
- lymphoma
  - contrast visualization of venae cavae in management of lymphoma (ab), Billy P. Sammons et al, Dec., 944
  - malignant lymphomas of gastrointestinal tract (ab), Joe W. Frazer, Jr., Dec., 958
  - sieve (grid) radiotherapy of subcutaneous lymphoma (ab), E. Krokowski, Dec., 958
- melanoma
  - metastatic malignant melanoma of kidney simulating primary neoplasm; case (ab), Colvin H. Agnew, Sept., 482
  - metastatic pulmonary melanoma of 15 months duration (ab), Milton B. Rosenblatt and James R. Lisa, July, 130
  - metastases. See Cancer, metastases; other subheads under Tumors
- myeloma
  - extraosseous infiltration in multiple myeloma, James A. Gilroy and Andrew B. Adams, Sept., 406
- myoma
  - leiomyoma of duodenum (ab), W. N. Coombes, July, 139
  - leiomyoma of greater saphenous vein with preoperative localization by phlebography (ab), James A. DeWeese et al, Sept., 472
- neuroblastoma
  - neuroblastoma originating from olfactory epithelium (esthesioneuroblastoma) (ab), Paul A. Riemschneider and John T. Prior, Nov., 823
  - prognosis in neuroblastoma of childhood (ab), Wataru W. Sutow, July, 151
- osteoma
  - osteoid osteoma of vertebrae (ab), W. T. Mustard and F. W. DuVal, Dec., 951
- papilloma
  - tracheobronchial papillomatosis treated by roentgen irradiation; 2 cases, James Blackman, Simeon T. Cantril, Paul K. Lund and Donal Sparkman, Oct., 598
- retinoblastoma. See Retina
- therapy
  - some observations on treatment of certain radioresistant tumors (ab), G. E. Flatman, Nov., 826
  - Wilm's. See Kidneys, tumors
- THOBY, JOHN H. See CRAMER, LESTER M.
- TURELL, DAVID J., LITTELL, ARTHUR S., and LEVY, RICHARD P.: The effect of food on the 3-hour thyroidal uptake of  $I^{131}$  in human subjects (ab), Sept., 489
- TURNER, DAVID ALAN: The absorption, transport, and deposition of fat. Application of a new method for the determination of  $I^{131}$ -lipid activity in dogs and man (ab), July, 153
- TURNER, RODERICK D. See HANAFEE, WILLIAM N.
- TURTZ, ARNOLD I., and MAMELOK, ALFRED: Intracocular foreign body (ab), Aug., 287
- TUTTON, G. KENNETH, and OLLERENSHAW, ROBERT: The radiological investigation of intracranial abscess (ab), Aug., 286
- TYMPANIC MEMBRANE. See Ear

U

- UEBELHART, R., HINDERLING, W., and VOELLMY, W.: Osteopiklosis. A case report (ab), Aug., 309
- UHLMANN, ERICH M.: Clinical experience with high-speed electrons in cancer therapy, July, 76
- ULCERS. See Peptic Ulcer
- ULTRAVIOLET RAYS
  - ultraviolet microscopy of x-irradiated intestine (ab), Yevette S. Lewis et al, Sept., 496
- UMBRAZIL. See Brain, blood supply
- UNANDER-SCHARIN, LARS. See NORDLANDER, SVERKER
- UNDULANT FEVER. See Brucellosis
- UNGER, HAROLD M. See CASSEL, CHESTER
- UNGER, SOL M. See ROSWIT, BERNARD
- UPTON, A. C. See SCHWARTZ, E. E.
- URETERS
  - See also Pyelography
  - abnormalities
    - clinical importance of ureteral duplication and ectopia (ab), Ian M. Thompson and Arjan D. Amar, Aug., 313
    - reflux. See Bladder, regurgitation from
- URETHRA
  - roentgenography
    - experiences with Thixokon: the new urethographic medium (ab), David W. Goddard, Nov., 820
    - micturition cysto-urethrography: automatic serial technique (ab), C. E. Gudbjerg et al, July, 147
    - safe contrast medium for urethrography (ab), Ian M. Thompson, Aug., 314
    - screening urethrocystography of adult Bantu males under manometric control: normal and pathological findings (ab), T. Richard, Dec., 953
    - Thixokon cystourethrography (ab), James F. Glenn, Aug., 314
  - views on value of urethrocystography in determining indications for surgery in prostatic hypertrophy (ab), Hans Ekman, Sept., 483

**URETHROGRAPHY. See Urethra****URINARY TRACT**

- See also Bladder; Kidneys; Pyelography
- calculi
  - deduction of chemical composition of urinary calculi by radiological means (ab), George Cohen, Oct., 661
- roentgenography
  - classification of urographic patterns in children with congenital bladder neck obstruction (ab), Aurelio C. Usen et al, Sept., 482
  - comparative study of urographic contrast media (ab), Loren E. Hart et al, Aug., 313
  - simple protection device for urologic units (ab), Joseph E. Whitley, Aug., 327
  - simultaneous cholecystography and urography with new medium "Duograhn" (ab), Theodore L. Orloff, Aug., 315
  - some uses of cineradiography in urologic diagnostic problems, William N. Hanafee and Roderick D. Turner, Nov., 733
  - use of x-ray cinematography in urological studies (ab), John A. Benjamin, Nov., 820

**URINATION**

- micturition cysto-urethrography: automatic serial technique (ab), C. E. Gudbjerg et al, July, 147
- peripheral control of micturition: cineradiographic study (ab), Marco Caine and David Edwards, Oct., 660
- voluntary control of micturition in man (ab), S. Richard Mueller, Nov., 821

**URINE**

- influence of age on excretion of radioactive iodine (ab), G. A. MacGregor and H. Wagner, Sept., 489
- iodine metabolism of endemic goiter on Aland Islands (Finland) (ab), B.-A. Lamberg et al, Sept., 490
- simplified method for urinary excretion test of absorption of cobalt-60 labeled vitamin B<sub>12</sub> (ab), Howard F. Corbus and Henry Nielson, Jr., Oct., 666

**UROGRAFIN. See Brain, blood supply****UROGRAPHY. See Pyelography****URSO, I. S. See CONGDON, C. C.**

- URSO, PAUL, CONGDON, C. C., DOHERTY, D. G., and SHAPIRA, RAYMOND: Effect of chemical protection and bone marrow treatment on radiation injury in mice (ab), July, 159

- USON, AURELIO C., JOHNSON, DONALD W., LATTIMER, JOHN E., and MELICOW, MEYER M.: A classification of the urographic patterns in children with congenital bladder neck obstruction (ab), Sept., 482

**—See LATTIMER, JOHN K.****UTERUS**

- cancer
  - argument against preoperative radium for endometrial cancer (ab), Chas. E. McLennan, July, 150
  - cervical cancer: radiation reaction in vaginal smear and its prognostic significance: studies on radiologically treated cases (ab), Olle Kjellgren, Aug., 319
  - cervical cancer: surgical and radiologic treatment in 397 cases (ab), Henry C. Frick, II, et al, Aug., 318
  - cervical carcinoma: environmental influences on healing (ab), Paul Hess, July, 150
  - cervical carcinoma: late results of radium therapy: clinical-statistical study on 798 patients treated at The Radium Centre, Copenhagen, during the period, 1922-1929 (ab), Bent Sørensen, Aug., 318
  - cervical carcinoma: results of therapy, 1948-1952, within scope of therapeutic results of a 30-year period (ab), Ernst Philipp and Karl Rumpfhorst, July, 150
  - pelvic lymph node dissection following radiotherapy (ab), Mary Jane Gray et al, July, 150
  - value of intraosseous venography in tumors of female pelvis (ab), Franz P. Lessmann and Grace M. Waldrop, Oct., 648
- cervix. See also Uterus, cancer
  - cervical canal and abortion (ab), W. J. Rawlings, Aug., 312
- cysts
  - hysterographic appearance of cystic glandular hyperplasia (ab), Per Bergman and Lennart Wehlin, July, 146
- roentgenography. See also Fallopian Tubes, roentgenography; Placenta, praevia; Uterus, cysts
- hysterographic study of uteri after cesarean section (ab), L. O. S. Poidevin and V. Y. Bockner, Aug., 311
- method of transfer of labor contractions to contents of uterus (ab), G. Narik, Dec., 952

## V

**VAGINA**

- radiation reaction in vaginal smear and its prognostic significance: studies on radiologically treated cases of cancer of uterine cervix (ab), Olle Kjellgren, Aug., 319
- VALENTINE, J. M. See FORREST, A. P. M.
- VALENTINO, VINCENZO: Combined intraventricular and intracerebral hydatid cysts: report of a case, Aug., 250
- van den BRENK, H. A. S.: The radiation hazard as it affects medical practice (ab), Nov., 834
- van der REIS, LEO. See van der REIS, MAURICE L.

van der REIS, MAURICE L., van der REIS, LEO, and VICAS, B.: Hyperplasia of Brunner's glands (ab), Dec., 947

VAN de VELDE, R. See PRIGNOT, J.

VAN ERP, YMKE. See SPECTOR, SAMUEL

van PUTTEN, L. M.: The life span of red cells in the rat and the mouse as determined by labeling with DFP<sup>22</sup> in vivo (ab), July, 154

VAN SCOTT, EUGENE J. See CRAMER, LESTER M.

VANTRAPPEN, GASTON, LIEMER, MARTIN D., IKEYA, JUNKO, TEXTER, E., CLINTON, Jr., and BARBORKA, CLIFFORD J.: Simultaneous fluorocinematography and intraluminal pressure measurements in the study of esophageal motility (ab), Nov., 810

VARADARAJAN, M. G.: Interposition of a loop of ileum between dome of diaphragm and liver (ab), Dec., 947

VARICELLA. See Chickenpox

VARICOSE VEINS

- clinical manifestations of primary varicose veins. I. An evaluation of some phlebographic findings in the deep veins (ab), Frits R. Mathiesen, Nov., 809
- VARIX. See Esophagus, varix; Veins, pulmonary

VAS DEFERENS

- vasoseminal vesiculography in hypertrophy and carcinoma of prostate (ab), Gunnar W. Vestby, July, 147

VAUGHAN, B. F.: Kinking of the aortic arch (ab), Oct., 645

The Nishibori symposium: collagen disease. Part 3: the radiological changes (ab), Oct., 663

VAUGHAN, JANET. See HINDMARSH, MARGARET

VEINS

- See also Portal Vein; Venae Cavae
- fatal venous intravasation of barium during a barium enema, Lee S. Rosenberg and Archie Fine, Nov., 771
- five-year observations on unsupported fresh venous grafts of aorta in dogs (ab), John E. Joseph et al., Sept., 470
- vascular syndromes from dilatation of arteriovenous communications of sole of foot (ab), Edmond Malan, Sept., 472
- zygous

  - relationship of systemic venous anomalies to paravertebral veins (ab), Herbert L. Abrams, July, 134

- cerebral

  - practical value of internal cerebral vein in anteroposterior phlebogram (ab), Frederick Murtagh and Herbert M. Stauffer, Oct., 639

- hepatic

  - venographic and scintillographic demonstration of liver metastases (ab), C. G. Helander et al., Oct., 652

- iliac

  - congenital atresia of inferior vena cava, common iliac veins, and left innominate vein: case with extensive development of superficial venous collateral circulation (ab), Kenneth F. Swaiman et al., Aug., 294

- innominate

  - anomalous drainage of all pulmonary veins into left innominate vein with interauricular communication: so-called Taussig-Snellen-Albers syndrome (ab), I. Ferrario, Sept., 471
  - congenital atresia of inferior vena cava, common iliac veins, and left innominate vein: case with extensive development of superficial venous collateral circulation (ab), Kenneth F. Swaiman et al., Aug., 294
  - pulmonary

    - anomalous drainage of all pulmonary veins into left innominate vein with interauricular communication: so-called Taussig-Snellen-Albers syndrome (ab), I. Ferrario, Sept., 471
    - cardiac dextroposition: hypoplasia of right pulmonary artery with right venous pulmonary drainage into inferior vena cava (ab), M. Torner-Soler et al., July, 132
    - diagnosis of complete transposition of pulmonary veins (ab), H. Hallerbach and A. Schaefer, Aug., 296
    - partial anomalous pulmonary venous drainage (ab), O. Flandra et al., Sept., 470
    - roentgen diagnosis of anomalous pulmonary venous drainage of right lung into inferior vena cava; 3 new cases (ab), Israel Steinberg, Dec., 944
    - transposition of pulmonary veins (ab), Maria Fogel et al., Nov., 807
    - varicosity of pulmonary vein (ab), B. Giménez and F. Horvath, Dec., 945
    - renal. See also Thrombosis

      - renal-vein catheterization and venography: a new technique (ab), W. S. Peart and David Sutton, Sept., 471

    - roentgenography. See also Bones, marrow; Brain, tumors; Extremities, blood supply; Femur, blood supply; Portal Vein; Varicose Veins; Venae Cavae; other subheads under Veins; etc.
    - phlebography and its significance in diagnosis of disease of veins (ab), K. G. Eysoldt, Oct., 647
    - saphenous

      - leiomyoma of greater saphenous vein with preoperative localization by phlebography (ab), James A. DeWeese et al., Sept., 472

    - vertebral

      - relationship of systemic venous anomalies to paravertebral veins (ab), Herbert L. Abrams, July, 134

VENAE CAVAE

    - cardiac dextroposition: hypoplasia of right pulmonary artery with right venous pulmonary drainage into inferior vena cava (ab), M. Torner-Soler et al., July, 132
    - congenital atresia of inferior vena cava, common iliac veins, and left innominate vein: case with extensive development of superficial venous collateral circulation (ab), Kenneth F. Swaiman et al., Aug., 294
    - contrast visualization of venae cavae in management of lymphoma (ab), Billy P. Sammons et al., Dec., 944
    - dynamics of orifices of venae cavae studied by cine-angiography (ab), Frank L. Campeti et al., Nov., 806
    - roentgen diagnosis of anomalous pulmonary venous drainage of right lung into inferior vena cava; 3 new cases (ab), Israel Steinberg, Dec., 944

VENTRICULOGRAPHY. See Brain, roentgenography

VENTRICLE, LUTZ. See PERRY, SEYMOUR

VERCO, P. W.: The accuracy of the radiological estimation of foetal age (ab), Oct., 659

VERMILLION, MARGARET. See DAVIS, LAWRENCE A.

VERTEBRA. See Spine

VERTEBRA PLANA. See Spine, diseases

VESTICULOGRAPHY. See Seminal Vesicles

VESTBY, GUNNAR W.: Vasoseminal vesiculography in hypotrophy and carcinoma of the prostate (ab), July, 147

WESTERDAL, JØRGEN. See MUNKNER, TROELS

VICAS, B. See van der REIS, MAURICE L.

VICHI, GIANFRANCO. See CAVINA, CESARE

VICKERS, CHARLES W., and KINCAID, OWINGS W.: Evaluation of conventional roentgenologic methods in the study of congenital heart disease (ab), Aug., 222

VIETEN, H. See ROTTHOFF, G.

VIKTERLØF, KARL JOHAN. See DAHL, OLOV

VISCERA

    - visualization of internal organs by accentuation scintillation scanning techniques, William J. MacIntyre, Hymer L. Friedell, Godofredo Gomez Crespo and Abbas M. Rejali, Sept., 329
    - transposition

      - situs inversus totalis associated with complex cardiovascular anomalies (ab), Karl J. Schmutzler and Leonard M. Linde, Sept., 468

VISION

    - visual field changes produced by x-ray treatment of pituitary tumors (ab), Max Chamlin, Aug., 324

VITAL CAPACITY

    - pulmonary radiation reaction: a vital-capacity and time-dose study, James R. Gish, E. O. Coates, Lucille A. DuSault and Howard P. Doub, Nov., 679

VITAMINS

    - B<sub>12</sub>

      - deposition and storage of vitamin B<sub>12</sub> in normal and diseased liver (ab), George B. Jerry Glass, Dec., 961
      - simplified method for urinary excretion test of absorption of cobalt-60 labeled vitamin B<sub>12</sub> (ab), Howard F. Corbus and Henry Nielson, Jr., Oct., 666

VOELLMY, W. See UEBELHART, R.

VOGEL, F. STEPHEN. See STEINBERG, ISRAEL

VOGEL, H. H. JR. See LESHER, S.

—See RAMBACH, W. A.

VOMITING

    - torsion of stomach as cause of vomiting in infancy (ab), S. Eek and H. Hagelstein, Aug., 301

VOS, O. See de VRIES, M. J.

VOSENAAER, TH. See SNIJDER, J.

VRABEC, RADKO. See KOLAR, JAROMÍR

de VRIES, M. J. and VOS, O.: Treatment of mouse lymphosarcoma by total-body x irradiation and by injection of bone marrow and lymph-node cells (ab), Nov., 837

W

WACKENHEIM, A. See METZGER, J.

WAGNER, BERNARD M. See CORIELL, LEWIS L.

WAGNER, H. See MacGREGOR, G. A.

WAGNER, STEPHEN. See KATZ, ISADORE

WAGSTAFF, JOHN K.: Clinical diagnosis in gastrointestinal hemorrhage. A planned investigation including arteriographic studies of the human stomach (ab), Nov., 810

WALHLBERG, PETER. See LAMBERG, B.-A.

WAHLBERG, T. See HELDE, M.

WAITE, JOHN H. See CRAMER, LESTER M.

WALDRÖP, GRACE M. See LESSMANN, FRANZ P.

WALKER, JOHN H.: Biliary tract roentgenography in lateral decubitus position (ab), Oct., 653

WALLACE, ELEANOR Z. See CARTER, ANNE C.

WANG, C. C., YALAND, ERNEST M., and GEPHART, THOMAS: Carcinoma of the sigmoid colon: report of two inoperable cases with favourable results five or more years following radiation therapy (ab), Nov., 825

WARTHIN, THOMAS A., and BUSHIEFF, BORIS: Pulmonary actinomycosis (ab), Aug., 290

WASHKO, P. J. See ARNOLD, HARRY L., JR.

WATER

    - accumulation of polonium (Po<sup>210</sup>) by water-living organisms (ab), V. Z. Agranat, No., 833
    - transmission of radioactive strontium through food from open water reservoirs into human organism (ab), A. N. Marei et al., Nov., 833

WATKINS, DAVID H. See SALZMAN, EMANUEL

WATSON, G. See ROBERTSON, C. W.

mon iliac extensive circula-  
294  
rement of 44  
by cine-  
Nov.  
venous 3 new  
; 3 new  
y  
estimation  
ENCE A.  
aphy in  
b).  
GS W.:  
hods in  
292  
scintil-  
Hymer  
bas M.  
cardio-  
er and  
ment of  
y and  
Lucille  
al and  
61  
absorp-  
ward F.  
y (ab).  
e lym-  
injec-  
Nov.  
stroin-  
(ab),  
ART,  
ort of  
re or  
825  
Pul-  
organ-  
from  
A. N.

Watson, HAMISH, PICKARD, C., LOWE, K. G., and HILL, IAN: Selective cine-angiocardiology with image intensification (ab), Aug., 299

Watson, JAMES A. See JENNETH, W. BRYAN

Watson, JAMES S., Jr. See CAMPETI, FRANK L.

Watson, T. A. See CRAM, R. W.

Waugh, JOHN M., and LYNN, THOMAS E.: Clinical and surgical aspects of pancreatic pseudocyst; analysis of fifty-eight cases (ab), Aug., 308

Waugh, W.: The ossification and vascularization of the tarsal navicular and their relation to Kohler's disease (ab), Sept., 480

Wayne, DAVID L. See EYLER, WILLIAM R.

Webber, MILO. See BISHOP, HARRY A.

Webb-Peplow, HAMILTON. See DREIZEN, SAMUEL

Weber, H. H.: Brucellosis and Echinococcus in Argentina. A short clinical and radiological report (ab), Aug., 315

Weber-Christian Disease. See Panniculitis

Webster, J. E., and GURDJIAN, E. S.: Observations on hemiplegia with middle cerebral artery trunk occlusions and with "normal" carotid angiograms (ab), July, 128

Weckman, NILS. See SÖDERBERG, ULF

Weder, C. H. See CRAM, R. W.

Weens, H. S., and Rohrer, R. H., and Youmans, H. D., Jr.: Radiation exposure of patient and personnel during urographic procedures (ab), Nov., 836

—See JOHNSON, HENRY C., Jr.

Wegele, OTTO. See LAMBERG, B.-A.

Wehlin, LENNART. See BERGMAN, PER

Weiner, ISRAEL H., AZZATO, NICHOLAS M., and MENDELSOHN, ROBERT A.: Cerebral angiography: a new technique. Catheterization of common carotid artery via superficial temporal artery (ab), Sept., 463

Weisenfeld, SHIRLEY. See CARTER, ANNE C.

Weissbluth, MITCHEL. See KALLMAN, ROBERT F.

Weldbourn, R. B. See EDELSTYN, G. A.

Welders, AND WELDING

—clinical, radiographic, and pathological studies of lungs of electric-arc and oxyacetylene welders (ab), H. E. Harding et al., Sept., 466

Welin, SOLVE: Modern trends in diagnostic roentgenology of the colon. The Mackenzie Davidson Memorial Lecture (ab), July, 140

Werder, ALVAR A. See HARDIN, CREIGHTON A.

Werner, K., BUTTERBERG, D., and Zeitz, H.: Roentgen examination of the breast (ab), July, 137

West, KELLY M. See JOHNSON, PHILIP C.

Whedon, G. DONALD. See REANEY, ROBERT P.

Whelan, R. F. See FORSYTHE, W. I.

White, JULIUS. See TOAL, JANE NICOLET

—See WILLIAMS, R. BLAND, Jr.

Whitehead, RICHARD W., LANIER, RAYMOND R., and Thompson, JERRY B.: The combined effect of radiogold and nitrogen mustard and radiogold and certain other compounds on the Ehrlich ascites carcinoma (ab), Oct., 666

Whitley, JOSEPH E.: A simple protection device for urologic units (ab), Aug., 327

Wiberg, GUNNAR. See KNUTSSON, BERTIL

Wickbold, INGMAR. See BARLT, OSBORNE

Wiedenmann, O.: Perineural cysts of the lumbar and sacral nerve roots (ab), July, 143

Wiesner, JEROME J. See MUNSLOW, RALPH A.

West, W. G., FUJIMOTO, G. I., and SANDBERG, A. A.: Metabolism of progesterone-4-C<sup>14</sup> in a postmenopausal woman with biliary fistula (ab), Sept., 490

Wilbur, KARL M. See BARBER, ALBERT A.

Wilbur, RICHARD S., and Bolt, ROBERT J.: Incidence of gall bladder disease in "normal" men (ab), Dec., 94

Wilder, CHARLES. See RYAN, ALLAN J.

Wilf, STEFAN. See STERN, W. EUGENE

Wilkins, EARLE W., Jr. See WYMAN, STANLEY M.

Wilkins, SAM A., Jr. See GAY, BRIT B., Jr.

Williams, HENRY L. See SCANLON, PAUL W.

Williams, JOHN R. See SAMMONS, BILLY P.

Williams, R. BLAND, Jr., TOAL, JANE NICOLET, WHITÉ, JULIUS, and CARPENTER, HARRY M.: Effect of total-body x radiation from near-threshold to tissue-lethal doses on small-bowel epithelium of the rat. I. Changes in morphology and rate of cell division in relation to time and dose (ab), July, 156

—See TOAL, JANE NICOLET

Wilms' Tumor. See Kidneys, tumors

Wilson, CLIFFORD, LEDINGHAM, J. M., and COHEN, M.: Hypertension following x-irradiation of the kidneys (ab), Aug., 326

Wilson, G. M., KILPATRICK, R., ECKER, H., CURRAN, R. C., JEPSON, R. P., BLOMFIELD, G. W., and MILLER, H.: Thyroid neoplasms following irradiation (ab), Aug., 325

—See BLOMFIELD, G. W.

Wilson, MICHAEL. See WINTERS, WILLIAM

Wilson, Sheldon R. See CORIELL, LEWIS L.

WINN, DEAN F., Jr. See LULL, GEORGE F., Jr.

WINTER, CHESTER C.: A new test for vesicoureteral reflux: an external technique using radioisotopes (ab), Nov., 820

Winters, WILLIAM, WILSON, MICHAEL, CHUNG-CHAROEN, DITHI, STAUFFER, HERBERT M., DURANT, THOMAS M., and OPPENHEIMER, M. J.: Use of intravascular carbon dioxide gas to demonstrate intertrial septal defects (ab), Nov., 804

Witcofski, RICHARD L. See MESCHAN, I.

Wittenborg, MARTIN H. See FYLER, DONALD C.

Wolf, BERNARD S. See MARSHAK, RICHARD H.

Wolins, W., and Bond, V. P.: Hematologic findings in human beings given therapeutic doses of gallium-72 (ab), Aug., 322

Wollin, D. G. See AGNOS, JOHN W.

Wollman, SEYMOUR H., and Reed, FRANKLIN E.: Acute effect of organic binding of iodine on iodide concentrating mechanism of thyroid gland (ab), July, 153

Woltz, JOHN H. E., Bradford, W. Z., Bradford, W. B., and McCoy, JOSEPH B., Jr.: Complications of hysterosalpingography (ab), Aug., 311

Wood, ERNEST H., and BREAM, CHARLES A.: Spinal sarcoidosis, Aug., 226

Wood, PAUL: The Eisenmenger syndrome or pulmonary hypertension with reversed central shunt (ab), July, 131

Woodson, DONALD R. See HARDIN, CREIGHTON A.

Woollam, D. H. M., Millen, J. W., and FOZZARD, J. A. F.: The influence of cortisone on the teratogenic activity of x radiation (ab), Nov., 838

Woolner, LEWIS B. See SCANLON, PAUL W.

Woringer, E., BAUMGARTNER, J., and Braun, J. P.: The sign of early regional venous opacification in rapid carotid serial angiography (ab), July, 136

WORK IN PROGRESS

Determination of half-value layer, E. Dale Trout, John P. Kelley and Arthur C. Lucas, July, 107

Studies in coronary arteriography: systolic vs. diastolic appearance of coronary arteries, Ottheinrich Hase, Duncan A. Holaday and Ralph A. Deterling, Jr., Nov., 785

Thin-crystal scintillation counter, K. E. Corrigan and H. S. Hayden, July, 107

Wright, G. H. See FULLER, A. P.

Wrist

—anteroposterior projection of carpometacarpal joint of thumb by radial shift of carpal tunnel view (ab), Michael Burman, Aug., 310

—retarding effect of protracted undernutrition on appearance of postnasal ossification centers in hand and wrist (ab), Samuel Dreizen et al., Oct., 655

Wyckoff, H. O. See FRANTZ, F. S., Jr.

Wylie, EDWIN J., and Goldman, LEON: The role of angiography in the determination of operability in arteriosclerosis of the lower extremities (ab), July, 133

Wyman, STANLEY M., and Wilkins, EARLE W., Jr.: Angiography as an aid to identification of nonresectable pulmonary carcinomas (ab), Oct., 640

X-Y-Z

X-RAYS. See Roentgen Rays

Yaffe, DAVID. See FELDMAN, MICHAEL

Yanders, ARMON F.: The effect of dose rate on genetic damage from fast electrons in *Drosophila* sperm (ab), Nov., 838

Ykelestan, P. A.: Significance of peroperative cholangiography in the management of gallbladder disease (ab), Sept., 476

Youmans, H. D., Jr. See WEENS, H. S.

Young, A. C. See MASON, R. M.

Young, BARTON R., FUNCH, ROBERT B., MacMORAN, JAY W., STAUFFER, HERBERT M., and OPPENHEIMER, MORTON J.: Ultra-short (millisecond) timing in roentgen diagnostic procedures including angiography: comparison of dynapulse and impulse timing (ab), Nov., 804

Young, MILLINGTON O.: Acute appendicitis following retention of barium in the appendix (ab), Oct., 651

Yttrium. See Radioactivity, radioyttrium

Yuskis, ANTON S. See KUZMAN, WILLIAM J.

Zammit, F.: Undulant fever spondylitis (ab), Oct., 656

Zauissis, ALEXANDER L., and James, J. I. P.: The iliac apophysis and the evolution of curves in scoliosis (ab), July, 144

Zaret, MILTON M. See LENTINO, WALTER

Zatuchni, JACOB. See SOLOFF, LOUIS A.

Zeitz, H. See WERNER, K.

Zelman, SAMUEL: Necropsy evaluation of the gas contrast roentgen visualization of liver and spleen (ab), Oct., 652

—and Lewin, HANS: Adult agammaglobulinemia associated with multiple congenital anomalies (ab), Oct., 662

Zheutlin, NORMAN, HUGHES, DIXON, and O'LAUGHLIN, BERNARD J.: Radiographic findings in renal vein thrombosis, Dec., 884

—See FALKENBACH, KARL H.

Zill, HARRY. See RÖCHLIN, DONALD B.

Zinc, Radioactive. See Radioactivity, radiozinc

Zollinger, H. U., and Hensler, L.: Old massive pulmonary embolism (ab), Dec., 945

Zupfinger, A.: The hazards of ionizing radiation (ab), Sept., 494